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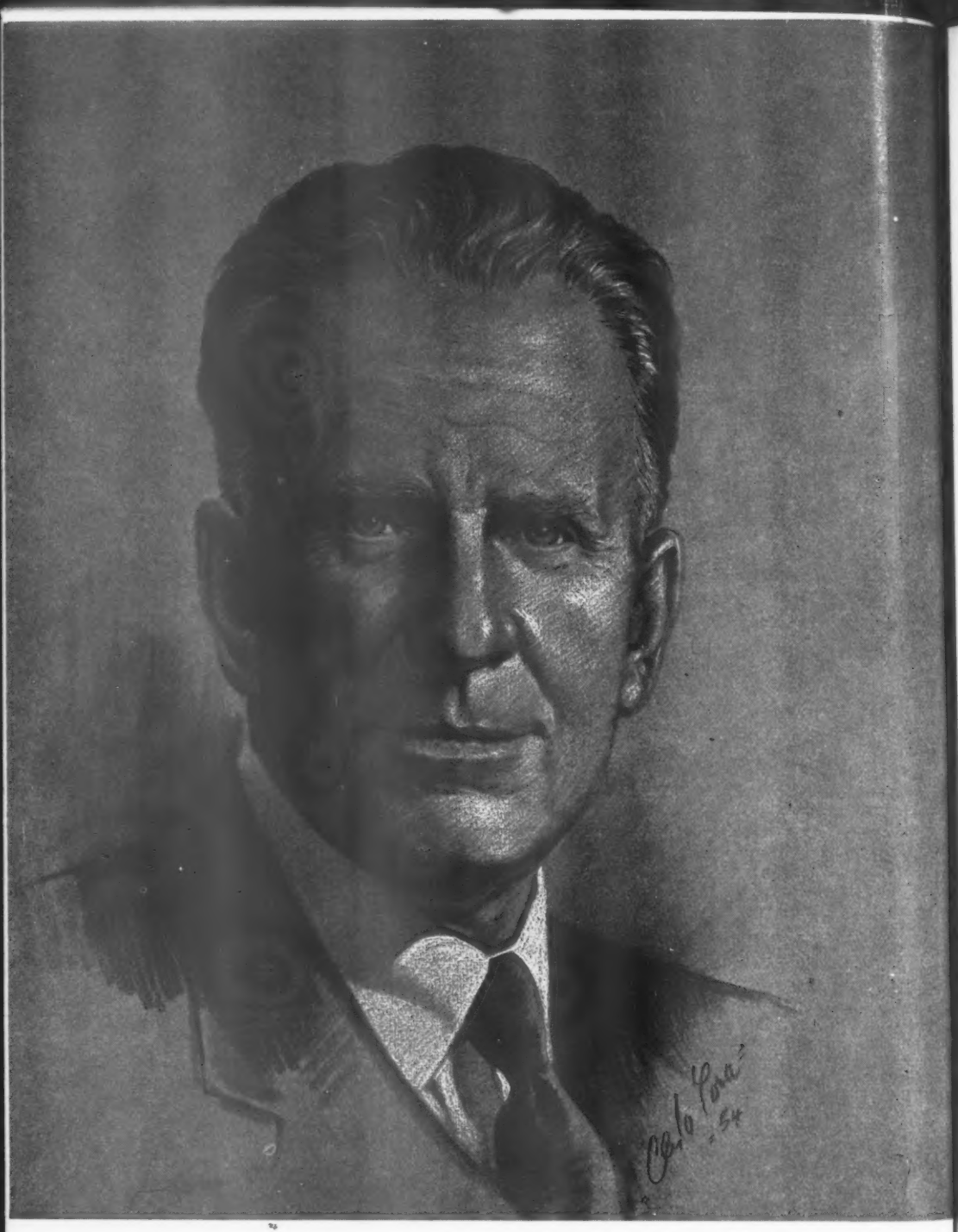
An Unpleasant Shock

The new price increases announced for coal will come as an unpleasant shock to all manufacturers, but it is the potential rise in the cost of coke which will impinge most severely on the foundry industry. The awkward part of the increases is that they follow closely on the heels of a recent announcement by founders of a percentage increase in selling prices, for their severity will be such that it will be difficult, if not impossible, to absorb internally. From an examination of the coal and coke situation over the post-war years, the foundry has had the thick end of the stick. In 1952, the gas industry and coke producers were receiving similar treatment, but since that time the national average increases have been of the order of 3s. for gas making and 4s. for coke manufacture, but according to a bulletin of the Council of Ironfoundry Associations "it is believed that the average in Scotland is about 7s. 6d. per ton; in Durham about 5s. 3d. per ton; and in South Wales about 8s. per ton." Two of these are the areas from which the foundry largely derives its supplies of coke, and hence the crushing increase announced.

The Coal Board expects to finish this year with a deficit of about £17 million in addition to accrued losses of about £14 million. At any new price levels, these adverse balances will, if calculations be correct, be wiped out and a surplus given by the end of 1955. The Coal Board is under statutory obligation to make its accounts balance over a period, but the actual period has not been defined. The C.F.A. article to which we have referred continues: "Further, when the N.C.B. accounts for the years 1949, 1950 and 1951 are examined, it is found that the results of those years were debited with profits tax to the extent of £3.5, £2.5 and £2 million—a total of £8 million. Why should industry pay in 1954 and 1955 to enable the N.C.B., as one Government department, to pay another Government department (the Inland Revenue)?" Other forms of book-keeping such as debiting the losses on the sales of imported coal and the costs of plant not yet fully remunerative are factors in the new increases in prices which give rise to doubt as to their reasonableness, equity, or even necessity. Protests have been made, but need to be reinforced by the individual action of every foundry owner with his local member of Parliament.

Fuel and other raw materials are becoming so exceedingly expensive that the traditional economy of the cupola as means of providing liquid metal will need careful scrutiny. Steelmakers have largely changed over from the traditional producer-gas to oil as their major fuel and even that innovation is now being challenged by electricity. So, too, the ironfounders will have to examine very carefully the latest developments—and there are many—in the direction of fuel economy for the production of molten cast iron.



HAROLD HARTLEY, C.B.E., D.Sc.

Chairman of Radiation Limited and President of the Institute of Vitreous Enamellers.

Leaders of the Industry

HAROLD HARTLEY, C.B.E., D.Sc.

DR. HAROLD HARTLEY, C.B.E., is well known and highly regarded in three distinct but related industries—ironfounding, gas engineering and vitreous enamelling. In each of these he has been especially prominent in research activities. In ironfounding, it has been as chairman and, later, as president of the British Cast Iron Research Association. It was during his chairmanship of this body that the headquarters were transferred to Bordesley Hall and so equipped that the Association now occupies such a commanding position amongst organizations devoted to the study of cast metals. In the field of coating metals for improved surface and infinitely better appearance, Dr. Hartley presides with real distinction over the Institute of Vitreous Enamellers and his influence on that body will long be felt.

Dr. Hartley's interest in towns' gas dates back to 1909, when he was awarded a fellowship in gas research under the late Professor Bone at Leeds University. From this position came an appointment as chief chemist to Richmonds Gas Stove & Meter Company. When Radiation, Limited, was formed, he became the head of the research department and about this time (1919) was awarded the degree of D.Sc. by Manchester University. He became active in the gas industry again in 1936, when he was a member of the Joint Research Committee of the Institution of Gas Engineers and of Leeds University. Six years later, he was on the Council of the former, and became president in 1947. In 1950, he was elected an honorary member of the Institution and received its premier award—the Birmingham Medal.

Dr. Hartley, who was born in the Isle of Man, graduated with first-class honours in chemistry at Manchester University. After a year holding a Gartside Scholarship in Industry and Commerce, he travelled in Norway and Canada studying power production for the electro-chemical industries. His varied activities and obvious hard work have well combined to qualify him for the position he now holds—that of chairman of Radiation, Limited.

Dr. Hartley takes real pleasure in country life. Long rambles, and a deep interest in sports and literature, combine to fill that short amount of leisure time associated with the life of a prominent industrialist.

Export of Large Forging Press

An exceptionally large forging press made by Wilkins & Mitchell, Limited, Darlaston, for Canada, weighing over 90 tons and with a 2,200 tons capacity, presented some difficulties of transport. A 250-ton crane was necessary to load the press on board ship and the crane had to be towed up the Manchester Ship Canal from the loading point. When the press reaches Canada special arrangements have been made for its unloading. No adequate crane is available at Montreal and the press has therefore to be taken to Sorel, further down the St. Lawrence, where it can be taken off with the aid of sheer legs. To transport the press from Sorel to the factory where it is to be installed at Toronto, a specially constructed flat car, of which there are only four in all Canada, will be necessary.

Mr. Frank Fisher, assistant service manager of Wilkins & Mitchell, has left for Canada to supervise the assembly of the press.

Forty Years Ago

In the FOUNDRY TRADE JOURNAL for May, 1914, was a paper read before the Lancashire branch of the British Foundrymen's Association on "The Foundry Chemist." The Author, Mr. A. Harrison, stated that it was common practice to use up to 50 per cent. of steel in cupola charges. Moreover, he states he used 35 per cent. of steel scrap in 1900 to advantage. There is a layout of an iron foundry by one of the noted foundry managers of the time, yet for transport there are but two overhead and four jib cranes. Here is a case where real progress has been made, for the drawing shows mechanical-handling to be in its infancy.

INCOME of the British Non-Ferrous Research Association for the year 1953 was £134,209, against £128,436 in 1952. Expenditure was £126,754 (£120,996), leaving £7,455 (£7,440).

Awards for Ideas

Cash awards up to £500 are being offered at the Rolls-Royce Aero Division's factories at Derby for ideas which will lead to the saving of time and material in manufacturing operations. The *Rolls-Royce News* says that problems of organization have caused earlier suggestion schemes to die out. In the new scheme which started on April 26, awards from £1 to £500 will be made by a suggestion committee. Only hourly-paid employees on the shop floor will be able to take part at first, and the scheme applies only to the Derby works. It is added: "After an experimental period, during which any snags are ironed out, the scheme may extend to other factories."

"The object of the new scheme is to enable the Aero Division to benefit from the vast pool of skill and talent which exists in the factories at Derby, and of course to reward workers for bringing forward money-saving ideas."

Dinner

INSTITUTE OF METALS

The Institute of Metals held a dinner last Wednesday week at Grosvenor House, London, W.1, in honour of the *Société Française de Métallurgie*. Dr. S. F. Dorey, C.B.E., F.R.S., presided. With him at the high table were Dr. E.-L. Dupuy (president of the French Société); Mr. A. D. Dodds-Parker, M.P.; the Comte de Crouy Chanel (representing His Excellency the French Ambassador); Dr. C. J. Smithells; Viscount Runciman of Doxford; Professor F. C. Thompson; and Dr. L. B. Pfeil, O.B.E., most of whom were accompanied by their ladies.

Change of Date

The Association of Bronze and Brass Founders states that the advisory service meeting which was scheduled for May 5 has been postponed. The date of the next meeting will be announced later.

The illustration shows the metal-working shop in the laboratories of the British Non-Ferrous Metals Research Association. A significant advantage of the tie-up of non-ferrous cast- and wrought-product research under one authority is that a wide range of equipment of superlative quality is at the disposal of foundry member-firms. This fact should be borne in mind when copper-base and aluminium founders are considering joining the Association.

Synthetic Resins in Core-bonding*

By W. Andrews

As will be appreciated, foundry applications of synthetic resins are many and varied and too extensive a subject for one Paper. The Author has, therefore, endeavoured to present a general summary of the outstanding features of resin corebinders, with brief mention of a few developments which have occurred since the initial research work was carried out. The report relates to experiences gained at Coneygre Foundry Company Limited.

Synthetic-resin binders for foundry core sands represent one of the comparatively recent developments in corebinding. Although experiments were being carried out earlier, both in this country and abroad, more general interest seems to have been aroused since about 1943. The history of the development of this type of corebinder seems to prove once again that "necessity is the mother of invention." The price of linseed oil—the conventional corebinder at the time—rose out of all proportion during the war and the years following, and supplies were often irregular. The foundryman was first attracted by the low price of resin binders, but when experiments were carried out it was obvious that other advantages would accrue. Development work was carried out in conjunction with plastics manufacturers, and two main types of resins were produced for foundry use. These are urea-formaldehyde and phenol-formaldehyde—for short, U.-F. and P.-F.

General Features

Although immediate savings in cost of sand mixtures were evident, it was obvious that the high price of linseed oil would not be maintained, and so the alien advantages had to be fully assessed before major changes in sand practice could be contemplated. These advantages can be summarized as follow:—(*a*) That reductions in stove temperature for drying cores were possible; (*b*) that reductions in baking time were not only possible, but necessary; and (*c*) due to the decomposition of the binders at lower temperatures, particularly U.-F. resin, core knock-out was easier and fettling was reduced. Offset against these were several disadvantages, and foundrymen encountered, and are still encountering, difficulties in practice.

Resin binders for wet core-sand mixes are marketed both in liquid and powder form, and there are also several "one-addition" binders obtainable. Resins for the "C" process of shell moulding are supplied, so far, in dry, powder form only. For wet core-sand, proportions of resin ranging between about ½ per cent. and 2 per cent. are usually mixed into a suitable sand together with proportions of a "green" bonding agent such as some form of cereal binder, starch and/or clays, and water. Small additions of paraffin, fuel-oil or one of the proprietary parting agents are beneficial, as they reduce stickiness which seems to be one of the characteristics of resin-bonded sands. Flowability of the sand is improved by these additions, thereby assisting core-blowing. Excess additions may, however, impair the surface finish of the cores. When using resin binders, it is essential to have an adequate understanding to the effect of all the raw materials used, including the sand.

Sand with a low clay content is most suitable, since excess of clay reduced the dry-strength properties imparted to the core by the resin. Mixtures should also be well balanced from the point of view of the proportion of water to cereal binder, since this has a distinct influence on the workability of the sand. Such factors as green-strength, plasticity and stickiness can be greatly influenced by this balance. In general, dry-strength improves as the amount of water added is increased, as is shown by Table I. The liquid resins available have varying solid-resin contents and, generally, resins containing a higher proportion of "solids" will allow increased amounts of water to be used. Since, however, cost of mixtures has to be considered, the choice of resin rests entirely with the foundryman.

TABLE I.—*Effect of Starch/Water Balance on the Properties of Cores.*

Per cent.			Lb. per sq. in.		Working properties.	
U.F. resin.	Starch.	Water.	Green-strength.	Tensile strength.	Ramming.	Stripping.
1½	1	1½	1.6	95	Good	Good
1½	1	2	2.1	160	Poor	Good
1½	1	2½	1.85	215	Poor	Good
1½	1	3	1.75	245	Fairly good	Good
1½	1	3½	1.6	273	Good	Fairly good
1½	1	4	1.35	285	Good	Fair

Baking

The shorter baking period required for resin-bonded cores seems to be one of the most important features. Unlike oil-bonded cores, they do not require the presence of oxygen during stoving, as polymerization takes place as soon as the moisture is driven from the core. Baking cycles are usually of the order of 50 to 60 per cent. of those required by oil-bonded cores of similar size and section. Fig. 1 shows a graph of tensile strength of cores against baking time (temperature 200 deg. C. The mixtures are balanced to give maximum core tensile of approximately 250 lb. per sq. in.). The immediate effect in the coreshop of these reduced baking times was that core stoves which had been worked for two shifts per day were found to be capable of handling the same bulk of cores when worked for

*Paper read before the Birmingham branch of the Institute of British Foundrymen, with Mr. T. H. Taft presiding.

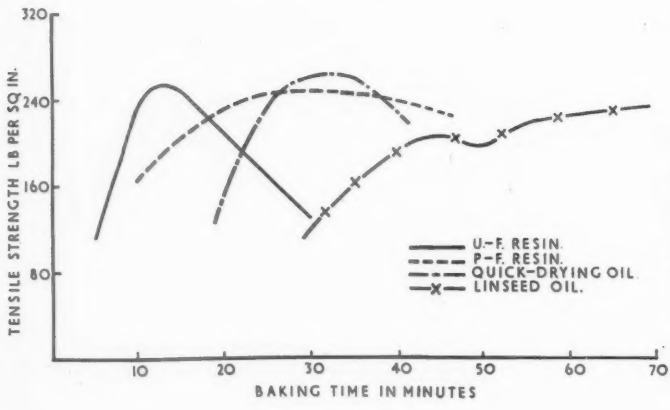


FIG. 1.—*Graphs of tensile strength against baking times for comparative sand mixtures, using different bonding materials.*

one shift per day. Temperatures were reduced and, in all, considerable fuel savings were effected. It was also found possible to spray cores with blacking, where necessary, prior to baking, thereby eliminating, in certain cases, the necessity for a blacking stove. Prior spraying with water has the effect of producing a particularly hard skin, since it appears some of the resin then migrates to the surface of the core. Care must be taken, however, that cores prone to sagging are not saturated either with water or blacking, as this would increase the likelihood of this defect occurring. A possible development with resin-bonded cores is the use of only partly-dried cores, that is, in some cases cores with only a cured outer shell, 1½ in. to 2 in. deep, and still having a "green" centre, may be safely used in the foundry. The Coneygre Foundry has been producing castings on one of their running lines using cores dried in this way and has obtained consistently good results over a number of years.

It is also an accepted fact that resin cores are particularly reactive to the high-frequency electric method of drying, though the Author cannot speak of any personal experience in this connection.

Core Properties

Sagging or slumping is much more common with resin-bonded cores, as the cereal or starch binder addition seems to impart a plastic and almost rubbery property to the sand mixture. The remedy would seem to be an addition of some form of acid accelerator to the mix, for example, boric acid in order to speed up drying of the skin or an accurate control of green-strength by means of additions of a clay, such as bentonite. The latter, though possibly the better method, would probably necessitate the use of higher resin percentages, since clay additions have a detrimental effect on dry-strength other things being equal. On the other hand, bench life would be considerably influenced by the addition of an accelerator, and friability of the surface of the baked core would almost certainly result. An important factor which has a distinct influence on sagging problems is the moisture content of the sand mixture. High moisture additions should not be made where a tendency to sagging is likely. It may be a wise policy to use a dextrin instead of a starch binder, as dextrins do not permit the use of high percentages of water and skin drying is consequently accelerated.

Ease of knock-out after casting is one of the claims made for resin-bonded cores. This is particularly true in the case of U.-F. bonded cores, since U.-F. resin decomposes at a much lower temperature than either linseed oil or P.-F. resin. Conversely, this means that hot-strength is poorer, premature breakdown is likely where cores are exposed to heavy metal sections and finish can be impaired; the use of a good blacking or a refractory wash is beneficial in such cases. P.-F. resin behaves similarly to oil binders in this respect.

Gas evolution is an important consideration in any core-sand mixture. U.-F. and P.-F. resins differ in the respect that, whereas gas evolved from a U.-F. sand core has a high rate of evolution, gas from a P.-F. resin-bonded core is evolved at a slower rate and is usually of smaller volume. Compared with oil-bound sands, resins usually evolve less total gas, though rates of evolution differ. Fig. 2 shows the gas evolved from cores bonded with U.-F. and P.-F. resins, linseed oil and quick-drying oil.

This factor can be appreciably influenced by the composition of the sand mixture and by baking time. Apart from the resin binders themselves, another source of gas is the starch or cereal binder. One fairly reliable theory is that, due to the lower baking temperatures often employed for resin cores, the cereal remains largely undecomposed until the pouring stage when break-down is completed, with the consequent production of gas. It is therefore of extreme importance to limit the amount of cereal used. Care must be taken, however, that the dry-strength of the core is not reduced below the requirements of the individual job, for it is a salient feature of resin-bonded sands that resins or cereals on their own do not give such high dry-strengths as when used together. Baking time can affect the gas content of a resin core as under-baked cores will have a higher potential gas content. In the case of larger cores, this need not be a serious disadvantage providing adequate venting methods are employed. In general, because of the high rate of evolution, U.-F. resin cores need to have a positive venting system. Lightening-out of heavy sections by means of blocks and carriers, is advantageous where possible. Broken and scrap cores,

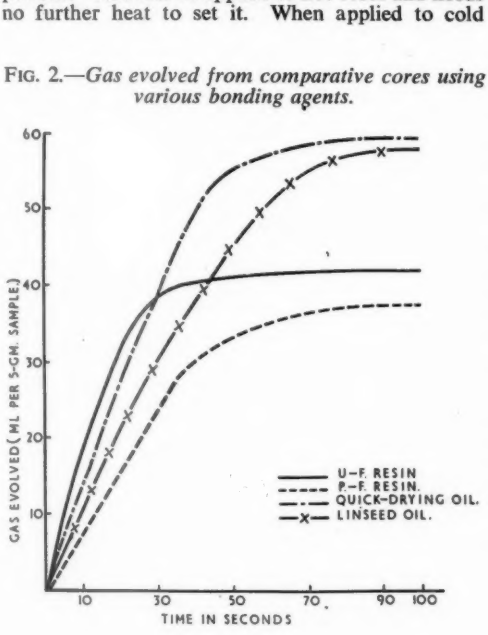
if available, can be used in the centres of large cores, with a consequent saving of sand. P.-F. resins, because of their lower rate of gas evolution, have been found particularly useful for water-jacket and pipe cores where venting is difficult, and where the core is almost entirely surrounded by metal.

Other Developments

In view of the gas evolved from cereal additions to core mixtures, experiments have been carried out to eliminate their use. Some measure of success has been obtained by coating the sand grains with a wax solution and then adding P.-F. resin, but with normal Congleton sand the mixture would not permit of any water additions. Using this method, green-strength results of around 0.8 to 1.0 lb. per sq. in. were obtained. Higher percentages of resin were necessary to obtain the required dry-strengths, and the final figures for gas evolution showed little change in the total gas evolved, though the rate was appreciably slower.

Apart from the use of resins in actual sand mixtures, the versatility of these binders encourages development work in other spheres. For instance, resins can be diluted with water—or alcohol in the case of some P.-F. resins—and used as sprays, with good results either on cores or moulds. There are several of these spraying materials available already mixed. Casting finish tends to be improved and in the case of cores, reductions in the proportion of resin binder to sand can be made. A further use for resins is in a core-paste; a quite useful paste can be made from U.-F. resin and boric-acid powder. This can be applied to hot cores and needs no further heat to set it. When applied to cold cores considerably less heat is required for permanent jointing than with a normal flour-type paste, and a stronger joint is obtained.

FIG. 2.—*Gas evolved from comparative cores using various bonding agents.*



A development (which is the subject of British Patent No. 698202) is the reinforcement of cores by means of string or fibrous material coated with a resin. This process deals with the impregnation with resin, of string, or a suitable material, and either hardening the resin by heat or by use of an accelerator prior to insertion in the core. Alternatively, the impregnated string may be used while still in a flexible state prior to the hardening of the resin. An increase in tensile strength is obtained, since the resin forms a bond with the core itself, and is eventually hardened during the stoving of the core. The advantage of this means of reinforcement is that, on casting, the materials decompose and are removed with the burnt-out core sand, thus saving time in cleaning.

Shell Moulding

No paper on synthetic resins would be complete without mention of the "C" process of shell moulding. There has been a great deal of interest aroused throughout the foundry industry by this development. The basic principles of the process will be familiar to the majority of foundrymen, and since there have been regular reports in the technical Press of experience in the use of the process, it is only intended to make a few general comments here. One opinion of the process expressed and which the Author endorses, is that it is not the "be all and end all" of foundry problems. Personal limited experience is that although castings of improved finish and greater dimensional accuracy can be produced, foundry problems are often increased.

Several quite elaborate machines have been offered for utilizing this process, but although these seem to do their job adequately it is not thought beyond the scope of the foundryman to adopt methods and less expensive mechanical aids to satisfy production requirements. This process, however, has at least served one useful purpose, and that is, that it has tended to make the foundryman more conscious of the need for development within the industry. Already resin manufacturers are endeavouring to provide founders with sand precoated with resin and it is possible to foresee the possibility of someone supplying the industry with ready made shell moulds and cores which need only to be assembled and poured.

In conclusion, the author believes as far as resin binders are concerned that only "the surface has as yet been scratched." If the basic principles of mixing a thermo-setting resin powder or liquid with sand and then bringing the resultant mixture into contact with a hot patternplate or corebox by means of dumping, blowing or slinging, are applied, then results will ensure a permanent place for resins in the foundry industry.

Acknowledgment

In presenting this Paper the Author would like

to express his thanks to the directors and management of Coneygre Foundry Company, Limited, for their co-operation.

MR. CHERRY proposed that a vote of thanks be accorded the lecturer. This was seconded by MR. BUSHNELL and cordially endorsed by the meeting.

DISCUSSION

MR. HALL asked whether Mr. Andrews would mind explaining again Table I showing the starch: water balance, as he had not quite seen the point which he tried to make. Mr. Andrews had showed the advantage of a urea resin resulting in a very short baking time, but that could, he thought, be construed a disadvantage if many and various sections were being made, as the critical baking time could be a disadvantage in this connection.

MR. ANDREWS replied that what he had set out to prove was that starch and water balance would affect the working quality of the sand, and that excess moisture addition did tend to promote stickiness in the sand mixtures. The Table had shown that with 2 per cent. moisture the maximum green-strength of 2.1 lb. per sq. in. was developed. At 4 per cent. moisture it only decreased to 1.35 lb. per sq. in. but in that range there was an increased tensile strength from 160 lb. per sq. in. to 285 lb. per sq. in., or about 70 or 80 per cent. increase. He was not suggesting these as basic formulæ for sand mixtures, as they had obvious disadvantages, but it was a simple illustration of how the water and cereal could act.

MR. HALL asked which of the proportions given, Mr. Andrews would himself have used.

MR. ANDREWS said it was usual to use a slightly higher moisture content than was actually necessary, providing the sand could be used from the mixer fairly quickly. This gave an opportunity to develop higher tensile strength for a similar amount of resin, and it also tended to give the advantage that when the core had been made and probably stood around before going into the oven, it did actually develop green-strength as it lost moisture due to skin drying, and this would help with sagging problems. As to the second question he said he could only quote from his own experience. His company were at present running four continuous drying stoves in the coreshop and these were operated over a range of drying temperatures from 175 deg. C. up to 235 deg. C., and baking times from a minimum of 40 min. up to a period of almost two hours. Having that range of temperatures and drying cycle they had a good idea already what particular size and section of cores were best dried in each particular stove.

Limiting Factors

MR. HALL asked whether the Author would agree that given only one continuous stove to do the whole of the production, that practice might not represent such an economy.

MR. ANDREWS said he agreed in principle, but there were one or two things which could be done to help, for instance, if the core had a fairly small section, quite a heavy spray of water could be used which would tend to average out the section and tend to eliminate any over baking.

MR. GRICE referred to cores of different sizes, and asked whether a core could be sent round the oven as many times as was liked without affecting its properties in the mould.

MR. ANDREWS said this could be done providing it was practical, but he would not advise small cores going round a stove two or three times. Small cores which went round more than once showed signs of friability, and he said that he would not advise it in the case of U.-F. cores but with P.-F.-bonded cores there was a greater latitude.

MR. DRURY said he noticed that more emphasis had been given to starches than to dextrins, whereas his firm had found that dextrins were much nicer to use than starch.

MR. ANDREWS said that he agreed that dextrins gave a more flowable sand. The only snag with dextrins was that they did not allow the use of high moisture contents, consequently a higher resin content would probably have to be used to develop the necessary tensile strength and baking strength.

Blacking Difficulties

MR. CHERRY said his firm had been trying to black cores by dipping them, but the difficulty they had come up against was that the blacking would not stay on the cores, but tended to flow off. The addition of a "wetting" agent did not make any difference.

MR. ANDREWS said he had not come across this difficulty, but he would suggest if possible, the blacking of the cores before baking. If this were not possible, then the addition of some form of adhesive could be tried to the blacking mixture, probably even a small percentage of urea resin or similar, or a small percentage of a cereal mixed into the blacking. If this was mixed in water first, this would probably provide an adhesive between the blacking mixture and the core.

MR. TAFT said he knew of the difficulty to which Mr. Cherry referred, as he had experienced the same trouble. If the burner on the stove were not burning correctly, an invisible oily coating on the core was produced which might cause the trouble. His solution was some form of spirit blacking. Another suggestion—of which he had no personal experience—was some form of heavy clay addition to the blacking.

MR. ANDREWS asked whether Mr. Cherry had been referring to P.-F. or U.-F. mixtures.

MR. CHERRY said he had referred to P.-F.

MR. ANDREWS gave Mr. Cherry details of the blacking solution his firm used, which was plumbago in a bentonite/water suspension, with a small percentage of resin added as an adhesive.

MR. DIXON referred also to this problem and said that it was generally aggravated in some foundries by the use of non-volatile release agents. This more or less corresponded to the trouble mentioned from the burner. One way, he suggested, to overcome the difficulty was to introduce a liquid resin into the spray.

MR. TAFT referred back to Mr. Hall's question regarding the narrow time/temperature ranges on the graph shown, and asked Mr. Andrews, for cores run in the same stove, whether the tendency would be to friability, if many small thin protrusions from the main core were involved, and whether there would have to be variable drying periods.

MR. ANDREWS replied that his firm used a fairly comprehensive range of drying cycles and temperatures. The only other variable used to eliminate some of the trouble was spraying with water beforehand in order to damp those particular bits to which Mr. Taft referred. In the majority of cases, trouble had been overcome by this method. He said he was probably slightly biased in favour of P.-F. resins, but he thought they were as near an approach to the ideal corebinder as had been arrived at at present, apart from cost.

Mixture Details

MR. DIBALL referred to the gas-evolution curves shown in Fig. 2, and asked whether these were for the oil or P.-F., without other binders.

MR. ANDREWS said that each particular sand mixture contained cereal-binder additions. In the case of the resin mixtures, it was a starch binder, in the oil mixtures it was a dextrin binder. What he had endeavoured to standardize, were the physical characteristics of each of the four different sands in green-strength, baking strength, etc.

MR. DIBALL said he had found that with the U.-F. resin his gas-evolution had been very rapid and very high, due to the fact that with such a low temperature the starch binder had not been burnt out. The economics of U.-F. and P.-F. linseed oil, were that if any considerable degree of green-strength was required at all, about 6 per cent. resin was required, and this same value could be obtained with ½ per cent. of linseed oil.

MR. ANDREWS said he would not like to use a 6 per cent. U.-F. resin mixture in their foundry as one result would be that the welding shop would be full! His mixture developed 2.1 lb. per sq. in. green-strength with 1½ per cent. resin and 1 per cent. starch. At this stage, the tensile strength was only 160 lb. per sq. in., but using a higher moisture content, which would allow the use of a certain amount of clay in the mixture, this would develop the necessary green-strength. As a matter of interest, Mr. Andrews gave the following figures for core-sand mixtures used by his firm:—

A mixture containing 1¼ per cent. of U.-F. resin plus ¾ per cent. starch binder plus 0.3 per cent. of American bentonite, with about 2 per cent. water regularly developed a green-strength of 2 lb. and dry-strength about 250/260 lb. per sq. in. If green-strength where specially required, he would definitely recommend the incorporation of starch plus an addition of bentonite, as this allowed a tolerance with water content and sufficient green-strength could be developed along with adequate tensile strength.

MR. DIBALL said that the example to which he referred was the blowing of a core 20 per cent. high, with some rather large overhanging sections. When using ½ per cent. linseed there was a lower gas content.

MR. ANDREWS said that with 6 per cent. resin there would most certainly be a great deal of gas present. As to economics, he had worked out one or two prices on sand mixtures a short while ago, since when, linseed-oil binders had come down in price, but at that time, there was very little cost differential as compared with linseed-oil mixtures. He agreed that now linseed oil had been reduced in price, this would probably be the cheaper mixture. Phenol was much more expensive to buy, and although a low percentage of this could be used, the initial cost would be high. The advantages of resins were confined not to the initial cost but to a saving in baking time and possible savings in fuel from reduced temperatures, and also to the fact that with urea resins there was a far superior knock-out property.

Cost Comparisons

MR. HALL referred to the question of cost and said he was a bit dubious about this. He agreed that there were savings in fuel cost but he had found that the fuel was only a small item in the making of a core.

MR. ANDREWS agreed that this was so, but said that even so, with the competitive state of the industry at present, any savings which could be made were fully justified.

MR. TAFT asked whether it was not a fact that, ignoring the direct cost question that the adoption of resins gave greater productivity.

MR. ANDREWS said it was a fact that quicker returns could be obtained. His firm had not increased the number of men employed, but greater productivity had certainly been obtained.

MR. FORD said that when blowing of synthetic resin-bonded cores was started, very often they had to work with a wet mixture; he would like to know if Mr. Andrews had any experience of adding accelerators and how efficient they were in raising the green-strength. Regarding the question of price, he would like to ask Mr. Andrews the exact price in pence per lb. of the mixture detailed.

MR. ANDREWS said, as far as accelerators were concerned, it was a difficult question. His firm did use, in cores which were prone to sagging, etc., a small percentage of boric acid in the mixture—less than ¼ per cent. It tended to help with the skin drying and prevent any sagging. About four or five years ago, they had experimented with other types of accelerators, but the snags were that they were difficult to handle, and they had standardized, therefore, on boric acid.

Members would appreciate that prices had altered since his figures were prepared, particularly in regard to the oil binders, but not as far as the resin binders were concerned, but the figures he gave were as follow:—The cost of the urea-sand mixture, which contained 2 per cent. urea and ¾ per cent. starch, 0.3 per cent. of bentonite and a small addition of tractor vaporizing oil or paraffin, worked out at £1.87 per ton of mixed sand. This was comparable to a mixture using linseed oil 1¼ per cent., dextrin 1 per cent., bentonite 0.3 per

cent., at about £2 per ton of mixed sand. The phenolic resin, of course, was more expensive and worked out at almost £2.2 per ton of mixed sand, having only 1.6 per cent. of P.-F. resin, ¼ per cent. starch, and a small addition of tractor vaporizing oil.

Coreblowing and Resin Sand

MR. PRICE asked what the effects were of using these sands in coreblowers where a blower of fairly large capacity was used for blowing small cores. He also asked whether the resin-bonded sands deteriorated.

MR. ANDREWS said that coreblowing was possible and lack of bench life was not a thing they had trouble with. He had, he said, no experience with very small cores, but they had blown mixtures satisfactorily on blowers of small capacity. Frequently a resin-bonded sand was in the coreshop for the whole of a working day, and it deteriorated only very slowly, in fact, when they had first started using resin-bonded sands, he had particularly left a mix of U.-F. resin bonded sand on an ordinary core bench, not covered up, and two days later that sand was perfectly usable, provided the skin be taken off.

Quick-drying Oil

MR. MASSEY asked about quick-drying oil for corebinding.

MR. ANDREWS said his experience with quick-drying oil was only just beginning. It was a comparatively recent development as far as they were concerned, but he could foresee a distinct possibility of it being a good binder, and that it would replace some of the resin binders on the market if the results that preliminary tests had shown were maintained. On the calculations which had been shown regarding baking times, and with regard also to gas evolution, the quick-drying oil mixture developed tensile strengths in a similar time to the P.-F. resin, but still not as quickly as U.-F. resin. The mixture was slightly less critical in its reaction, but it would still need pretty fine temperature/time baking control. The total gas evolution figures were higher than for P.-F. and U.-F. resins, although the gas probably would not come off at such a rate as with the U.-F. However, he would not like to make any definite forecast on the potentialities of quick-drying oils at this stage.

Fumes

MR. FRANCIS referred to the problem of fumes from resin-bonded sands.

MR. ANDREWS said this was a very old topic, and one which had been used as an excuse by many founders for not pursuing early experimental work. He could only say that, as far as his firm was concerned, about 95 per cent. of their core-sand mixtures were resin bonded, and if Mr. Francis would care to visit their foundry he thought he would not notice any fumes.

ANOTHER MEMBER asked how many rejects Mr. Andrews got in comparison with the linseed-oil bonded material. He said he thought the control of the sand would certainly cost a lot more with resin-bonded cores.

MR. ANDREWS agreed that quite a lot of control was needed, but a simple method adopted was to use a cheap form of platform scale, marked off with the known amounts of powder, etc., ingredients. It did not mean a finer control from the point of view of having to have a foreman standing over the job, and it did not slow down sand mixing. At present, he said, his men were making in an 8-hour day something like 120 batches of sand. On whatever sand mixtures were adopted, Mr. Andrews said it paid to institute a certain amount of control.

Referring to scrap, he would like to make one point about breakages. For some reason or other, resin-bonded cores did tend to be more prone to breakages. However, there was a fair amount of handling of cores at his foundry, and, taking this into consideration, breakages were surprisingly low. It was, he said, a fact that the degree of breakage could be worsened by cutting down the amount of binder in the core-sand, and relying on spraying to produce a hard surface to the core. This tended to leave the core with a weak centre and more breakages resulted. In principle, resin-bonded cores tended to require more careful handling, but Mr. Andrews said no serious troubles on this score had been encountered.

Accuracy

MR. RUSSELL asked whether any figures could be given on comparative accuracy for baked resin cores and linseed-oil cores.

MR. ANDREWS said he could not give any comparative figures but he could say that providing the necessary teething troubles were overcome, it was possible to arrive at a core which compared favourably, as far as dimensional accuracy was concerned, with linseed oil. Over a period of 12 to 18 months on one particular job, rejects were very low indeed, once the basic troubles had been overcome, and once these troubles had been righted it was possible to maintain accuracy.

MR. LATHAM asked whether there was any possibility of pitch being used.

MR. ANDREWS said that this had been considered by the companies producing pitch. He himself, he said, had used mixtures of pitch and cereal binder, making up his own mixtures. The snags were that due to the high volatile content of pitch, somewhere in the region of 85 to 90 per cent., the gas developed appeared to be phenomenally high. Costs could probably be reduced, but whether it would be practical or not he did not know.

MR. MORGAN asked whether Mr. Andrews had had any reports of skin ailments among employees using the resin-bonded sands.

MR. ANDREWS said that they had had a few cases of dermatitis reported, but he thought it would be unfair to say that this was entirely due to the use of resin-bonded sands. Over a period of six or seven years there had been about four or five cases, and this was no more than before resin-bonded sands had been used.

MR. BERRY said that investigations by a medical officer had shown that certain people were allergic to these resin-bonded sands, and once they were taken off working with them, the trouble ceased.

MR. ANDREWS said he himself had felt no ill effects. In their factory mill hands were supplied with a protective grease which they could use before starting work, and antiseptic soaps were also provided for washing purposes, but whether the employees used these or not was entirely left to them.

MR. DIXON said that there were certain people who got skin diseases in all sorts of industries, and he suggested that, when this happened, enquiries be made into the type of detergent in use in the factory, as this had been found sometimes to be the cause of skin troubles.

MR. TAFT at this point had to bring the discussion to a close, and he thanked Mr. Andrews again for his lecture and for his handling of the questions put to him during the discussion.

Instructional Gas Turbine at Birmingham

Birmingham University has built the first instructional gas-turbine engine in the country to teach the men who will be the "spearhead of progress" in their firms. It has been erected on the ground floor of the new mechanical engineering block, part of the £500,000 extensions now being built at Edgbaston. The engine is incorporated in a unit designed specially for the study of the way air flows through the average turbine. It includes a compressor and air blowers. Later a closed-circuit wind-tunnel may be built inside the roof.

The turbine is practically all "home-made." Apart from the combustion chamber and fuel systems, which were supplied by Joseph Lucas, Limited, and the outer casing, it was constructed in the university workshops. Mr. Joseph W. Railly, who left his job as a designer to a firm of gas-turbine engineers two years ago to join the university staff as a lecturer, planned the layout of the plant, and designed the rotor and turbine systems. The 900 turbine b'ades were made in the workshops, and the Metallurgy Department advised on castings. The whole project was planned by Prof. G. F. Mucklow, head of the Department of Mechanical Engineering, and Prof. Frank K. Bannister, who occupies the Chair of Thermodynamics at the university.

So far some four or five men from industry have taken a course in the latest techniques in all kinds of engines (including gas turbines) every year, but this will be increased to 15. The maximum will be 22 or 23 because individual tuition is necessary. The men will need to have had a minimum of two years in industry, but preferably more, and they will either be university graduates or ordinary schoolboys with Higher National Certificates, who have voluntarily taken 12 months' university training.

Crane Fatality

While maintenance men were testing a 10-ton overhead travelling crane at the steelworks of Samuel Fox & Company, Limited, Stocksbridge, recently, the control became jammed in the "on" position, causing the crane to run into a 100-ton crane on the same track. The impact was such as to throw Wilfred Perkins, electrical fitter's mate, on to the mill floor 30 ft. below, where he struck a slag bogie. He died in Sheffield Royal Infirmary two hours later as a result of injuries received.

Ironfounding Fuel Efficiency

Fuel Efficiency News for April carries an article emanating from the Council of Ironfoundry Associations, which is abstracted below:—

Members of the ironfounding industry are well aware of the need for fuel economy and are taking every step to ensure it so far as is compatible with maximum efficiency within the foundry. During the war years, the Ironfounding Industry Fuel Committee issued several booklets on the use of fuel and, more recently, the development panel of the Council of Ironfoundry Associations (which studies the conservation and economical use of all raw materials, including fuel) has distributed many thousands of leaflets on the saving of coke specifically prepared for the attention of the men on the shop floor.

The industry is greatly concerned with not only the supply of coke but also its cost and quality. Despite a cut in coke supplies during 1952, a record output of castings was produced, which is an indication of more efficient use of the available supplies. So far as quality is concerned, it is apparent that the technical properties of solid fuel are important, since the coke is in direct contact with the metal; recent poor quality supplies having high sulphur content and reduced physical properties may be reckoned to have cost the industry some 70,000 tons of scrap castings. There is also a danger in reducing coke consumption so drastically that cracked castings may result. The British Cast Iron Research Association provides a direct advisory service on these and other problems through its Operational Research Team, which visits foundries all over the country.

Methods of Approach

In everyday foundry practice, fuel economy may be approached from the following main angles; general organization, the economic use of cupola coke and stove coke, and drying methods.

Organization is closely tied up with productivity and has received a great deal of attention from the industry. General advisory services have already been mentioned and several points of interest emerge. There is, for example, the possibility of co-ordinating the melting and moulding sections of the foundry. Some foundries have already achieved coke savings by rearranging the moulding programme, so that the same tonnage is achieved with fewer melts per week.

Economy in the use of cupola coke may be more specifically achieved by guarding against the tendency to excess in coke charges; by a campaign for increased salvage of castings so that every legitimate means of saving a defective casting before scrapping and re-melting, thus saving coke and man/hours; by stopping the practice—should it exist—of using cupola coke for purposes other than melting metal and by bearing in mind the ratio of metal melted: cupola coke, so that everyone concerned is aware of the responsibility for improving it.

Drying operations involving the use of stove coke are being studied by a technical committee of the Institute of British Foundrymen. The greatest potential saving of fuel here would be for foundries to change over from dry-sand moulds to green-sand moulds where practicable, thus eliminating the drying process, or, where impracticable, to consider skin-drying possibilities. These suggestions for saving must always be put into practice with due thought and care, so that economy in the use of fuel does not cause an increase in scrap percentages, but within these limits the industry is doing its utmost to improve efficiency and at the same time develop productive capacity.

Notes from the Branches

Lancashire

At the annual general meeting of the Lancashire branch of the Institute of British Foundrymen, held on April 24, Mr. E. Jackson was elected president. Mr. A. Kirkham and Mr. W. Spenceley become senior and junior vice-presidents, respectively.

Other elections were:—Members of the Branch Council (three years): Mr. E. Beech, Mr. G. Studley, and Mr. G. Walker; branch representatives on General Council (one year): Mr. H. Haynes, Mr. D. Fleming, Mr. A. Kirkham, and Mr. C. R. Van der Ben; branch representative on Technical Council: Mr. C. R. Van der Ben; deputy-branch representative on Technical Council: Mr. W. Spenceley; auditors: Mr. D. Cameron and Mr. A. Smethurst; treasurer: Mr. H. Booth; hon. secretary: Mr. F. W. Nield; syllabus editor, Mr. R. Yeoman.

The hon. secretary, in his annual report for 1953-54, felt that it had been a most successful one from a prestige point of view. Works visits had proved successful and well attended. Works visited were: Hepworth and Grandage, Limited, Bradford; John Summers & Sons, Limited, Hawarden Bridge Steelworks, Chester; and Ferranti, Limited, Hollinwood. An interesting compilation of statistics was that there had been in all 146 questions asked at the total meetings, and an analysis of these questions was as follows:—Moulding practice, 41; patterns and pattern making, 37; metallurgical and melting practice, 26; mechanization and equipment, 18; moulding and core sands, 12; costing, 6; general, 4; refractories, 2.

Following the annual general meeting, the presentation of the medal to the winner of the John Wilkinson Short Paper Competition, was made by the retiring president of the branch, Mr. F. A. Harper. The winner of the first prize, who, in addition to the medal, received a cash award, was Roy Booth, aged 20, employed in a foundry for 5½ years. He is employed by David Brown-Jackson, Limited, of Salford. His prize-winning paper was entitled "Cast Steel Double Helical Blank Wheel."

The second in the competition (cash award) was Mr. D. W. Jones, of Walmsleys (Bury), Limited, Bury. Aged 20 years, he has been five years in the foundry, and his paper was entitled "A Pattern for a Semi-steel End Top Frame."

The third in the competition (cash award) was Mr. Maurice Hayton, aged 16 years, who has been one year and six months in a foundry. He is employed by C. M. Hesford, Limited, Ormskirk. His paper was entitled "The Moulding of a Tractor Winch Drum." There were 26 competitors in all.

Normally only three prizes are awarded, but a "Specially commended" announcement was made because of the excellence of a paper sent in by R. E. Spencer, who is only 16 years of age and has been employed in a foundry only six months.

He is employed by Sir Wm. H. Bailey & Company, Limited, Patricroft, and because of the excellence of his paper and the commendation of the judges of the competition, his firm had presented a spirit level which was contained in a case specially made at the works. Following the presentation of the prize-winning paper, there was a Foundry Brains Trust, and the guest question master was Mr. F. K. Neath, B.SC., supported by an all-Lancashire panel consisting of:—Mr. D. Fleming, Mr. B. Gale, Mr. E. Jackson, and Mr. W. Spenceley.

London—Slough section

At the annual meeting of the Slough section of the London branch, Mr. J. P. P. Jones, the president, reviewed a very successful session in the following terms:—

The first meeting, at which a paper on shell moulding was given by Mr. Fallows, of the Polygram Casting Company, possibly drew the largest audience that can be recollected in the history of the section. It certainly strained the capacity of this lecture theatre and demonstrated the lively interest throughout the industry in this new method of producing castings. Our next meeting of the session was the second joint meeting with the Slough branch of the Engineering Industries Association, and was much enlivened by the presence also of members of the Purchasing Officers' Association. Here foundrymen met many of their customers in privileged circumstances, and mutual satisfaction resulted from being able to discuss common problems impersonally.

The paper presented at the December meeting was by Mr. Lovat, of the British Industrial Sands concern, and proved one of the most interesting for a long time, and his subject, "Foundry Sands," is one so rarely dealt with at Institute meetings and yet, naturally, is of such great importance to every founder. The section may well hope it will be possible for Mr. Lovat to return at some future date with an enlarged edition of his paper and film.

In January, the section had the privilege of welcoming once again Mr. Hallett, of the Sheepbridge concern, who gave a most absorbing discourse, illustrated by slides, on centrifugal casting. This meeting was notable for its very wide appeal and there were present visitors from various parts of the South of England and even from as far away as Birmingham.

More recently, the section had a paper from one of its own members, when Mr. J. Wood spoke on "Runners and Risers." Using a background of information published to date, Mr. Wood presented a masterly summary of the problems so far unsolved and postulated means by which they might be tackled. It was clear members welcomed a paper such as this to clarify ideas and put a mass of research into clear perspective.

At the final meeting, Mr. R. W. Bailey, of the Zinc Alloy Development Association, gave an extremely factual paper on "Pressure-die-casting" and the use of zinc-base alloys in general, illustrated by a most instructive film. As this was a subject rarely touched upon in Institute meetings, it proved of more than usual value, especially to Slough section members, who were predominantly engaged in non-ferrous work.

At the business meeting, which preceded the report and technical programme recorded above, the following officers were elected for the next session:—As *president*, Mr. C. J. Williams; as *senior vice-president*, Mr. J. Wood, as *junior vice-president*, Mr. A. R. Parkes, and as *members of Council*: Mr. S. J. Williams (re-elected) and Mr. C. Britten (newly-elected). Mr. P. Hoesli was asked to continue as *honorary secretary*.

In concluding that meeting and the session's activities, the president was warmly supported in expressing a vote of thanks to High Duty Alloys, Limited, for the use of their eminently suitable Lecture Theatre for the section meetings, and the honorary secretary was commended for the success he has made of organizing the meetings and lecture programme.

Wales and Monmouth

The Wales and Monmouth branch held their annual dinner at the Royal Hotel, Cardiff. The guests included

the Lord Mayor (Sir James Collins), the (national) president, Mr. E. Longden, Mr. T. Makemson, Mr. Buckley, Bristol branch president, and Mr. G. W. Brown, Bristol branch secretary, most of whom were accompanied by their ladies.

Proposing the toast of the Institute, the Lord Mayor said he was pleased to note the aims of the Institute and the emphasis it placed upon the co-operation of science and industry. He was quite sure that it was contributing to the national effort for the recovery and maintenance of prosperity in a competitive world. He considered it an honour to be chosen to propose this important toast and to couple with it the name of Mr. Longden.

Mr. Longden responded suitably, and the next toast, that of the Wales and Monmouth branch, was proposed by Mr. T. Makemson, who recalled his early visits to South Wales when the branch was revived in the late twenties. He was pleased to note its steady growth, particularly the progress in West Wales, where a section had been in existence for the past few years. Referring to Mr. Mackinlay, branch president, he said here was a Scotsman, president of a Welsh branch and residing in England. Travelling from Bath to attend meetings in South Wales entailed some effort and Mr. Mackinlay had attended every meeting throughout his year of office, including those of the national Council. He was sure both he and Mrs. Mackinlay would remember this occasion with pride.

Replying, Mr. Mackinlay acknowledged the support of the branch council and members generally, with a special reference to the honorary secretary, Mr. A. S. Wall. Mr. H. J. V. Williams proposed the toast of the guests, including the ladies, and Mr. Buckley and Mrs. E. Rawden replied. It was Mr. Buckley's first visit to the Wales and Monmouth branch, but Mrs. Rawden's connection went back to the days she assisted her father, the late Mr. McClelland, as branch secretary. Musical interludes contributed to an enjoyable evening.

Newcastle-Upon-Tyne

The annual general meeting of the Newcastle-upon-Tyne branch was held in the Neville Hall, with the branch-president, Prof. A. Preece, occupying the chair; about 50 members were present. The secretarial and financial reports of the branch were presented and accepted. Commenting on the former, the president referred to the number of visitors who had attended their various meetings and suggested that members should act on the advice given in the secretary's report to raise the membership of the branch in this its Jubilee year. If each member took an active part in emphasizing the advantages of the Institute, there would be no difficulty in exceeding the suggested figure of 250 members. He laid particular stress on the varied and interesting series of lectures which had been provided during the session, and expressed thanks to the hon. secretary, Mr. F. Robinson, for the excellent report he had presented, which appreciation was endorsed by the members.

Election of Officers

The election of officers for the session 1954-55 was as follows:—As *branch-president*, Mr. C. W. Stewart; as *senior vice-president*, Mr. C. Nicholls; as *junior vice-president*, Mr. J. T. Fletcher; as *hon. secretary*, Mr. F. Robinson; elected to branch *Council*: Mr. J. R. Charlton; as *delegate to general Council*: Mr. C. Nicholls; as *representatives on the Technical Council*: Mr. G. Elston and Mr. J. T. Fletcher, and as *reception officers*: Mr. E. Charlton and Mr. W. E. Spraggon.

The branch award of £10 in connection with the Jubilee paper competition was presented to Mr. W. B. Hendry, who submitted the winning paper from the branch. (Mr. Hendry has now left the district to take up an appointment on the staff of the National Foundry College, but he was present at the meeting to receive the award from the president.)

Following the business meeting, two films were shown entitled "Charging and Operating a Cupola" and "Moulding on a Jolt/Roll-over/Pattern-draw Machine," which proved both interesting and informative, although, in the former film, a coke bed 45 in. high seemed to be abnormal for British cupola practice. Both films were produced by the U.S. Office of Education.

Exports Discussed at Cutlers' Feast

Flexibility, ingenuity, and resource were the watchwords in the campaign to make British industry competitive in foreign markets, Mr. D. Heathcoat Amory, Minister of State, Board of Trade, declared at the Cutlers' Feast in Sheffield recently. Stressing the need for our share in the world's trade to be maintained and expanded, he said that by the removal of all unnecessary controls and restrictions the Government was trying to loosen up a system that was becoming rigid and ossified as a result of post-war economic policies. Substantial progress had already been made; we were once more paying our way as a nation, and people in most parts of the world were again eager to acquire sterling, but there was still no room for complacency.

Mr. W. G. Ibberson, Senior Warden of the Cutlers' Company, gave a warning of the need for greatly increased efficiency in the production of fuel energy during the transition to nuclear energy. The red light of danger was signalling that the end of world coal and oil resources might be nearer than was imagined. They were advised to envisage the generation of electrical power directly from coal and to expect changes in the production of pig-iron and steel. These would create enormously increased efficiency over the present processes.

It was fitting, said Mr. Ibberson, that progress of this kind should first be announced in Sheffield, the home and workshop of so many distinguished metallurgists and engineers upon whose observation, inventiveness, and resource rested the foundations of our great industries. Earlier he had said that Hallamshire was the test laboratory and research centre of Britain and the recognized repository of knowledge in the development of steels for special purposes.

The demand for special steels came principally from the three major engineering industries—automobile, electrical, and aircraft—stated Dr. Sykes. The requirements of special steels for jet engines were well known, and now it seemed that in the very-high-speed craft even the wing material might have to be made in special steels to cope with the temperature set up by friction.

Another outlet for their steels was the industrial gas turbine, while the new atomic reactors for power generation posed new problems both for the forgemaster and the metallurgist. There was no question of the industry's having reached a state of stagnation.

ROLLS-ROYCE, LIMITED, ask for it to be made clear that there are at the present time many foundries producing all types of castings for their "Avon" engines, in addition to the Rolls-Royce Group of foundries. This stems from a paragraph in the JOURNAL (March 11, p. 282) dealing with Birmid development plans. Here a statement was reported to have been made by Mr. Harold Goodwin to the effect that only at the foundries of the Birmid group could such castings be made.

Institute of Metals

Joint Meeting with the Société Française de Métallurgie

Last week the Institute of Metals held a joint meeting with the *Société Française de Métallurgie*. The technical sessions were held in Church House, Great Smith Street, London, S.W.1. The annual meeting of the Institute was held on April 27 and was presided over by Professor F. C. Thompson. After the conclusion of the formal business, Mr. Donald McDonald presented to the Institute, on behalf of his firm (Johnson, Matthey & Company, Limited) a presidential badge of office. The Institute's Platinum Medal was awarded to Dr. Leslie Aitchison and the Rosenhain Medal to Professor A. H. Cottrell.

Immediately on being inducted into office, wearing the new presidential badge, Dr. Dorey delivered his inaugural address, in the course of which he introduced quite a few aspects of foundry practice. Before luncheon, a cocktail party was held, providing an opportunity of social contact with the French and other overseas guests. In the afternoon, and indeed on each day of the meeting, there were technical sessions and works visits. In the evening, there was a Government Reception at which the guests were received by the Rt. Hon. Duncan Sandys, Minister of Supply. On Thursday evening, there was a dinner and dance at Grosvenor House, attended by over 550 people. It was a really enjoyable evening with good, yet commendably short speeches.

On Friday evening, there was a reception at the French Embassy, where the guests were received by His Excellency the French Ambassador.

On Saturday there was a motor-coach excursion to Canterbury, Rochester being visited on the return journey. It was a very pleasant outing but one which was sparsely supported by local members. This week, the guests are visiting a number of works in the provinces.

Early Swordmaking

A 1,000-YEAR-OLD SWORD found by a Sheffield schoolboy in the River Witham in Lincolnshire has been X-rayed at Hadfield's research laboratories, and found to be pattern-welded in at least six primary lengths of metal. Both edges have been made separately and wrought on to the centre portion, which comprises four thin strips of metal, twisted separately before welding. This method, which produces an ornamental effect, with greater resilience, has been recognized only in the past few years, as a result of the application of X-ray technique to the products of the old swordmakers. The sword, considered to be the finest ever found in Britain, is at present being cleaned at the British Museum laboratories. The blade is thought to be of north-German make, attached to an Anglo-Saxon hilt. A final report, including spectrographic analysis of the metal bands round the grip, is awaited from Hadfield's, Limited.

STEWARTS AND LLOYDS, LIMITED, has received an order to supply about 350 miles of 16-in. dia. pipe for use in Pakistan. It will be used to construct a pipeline costing £10,000,000 from the natural gas field at Sui, in Baluchistan, to Karachi. Shipments of pipe are expected to begin in June and to be completed by the end of next January.

New Catalogues

Runabout trucks. The Liner Concrete Machinery Company, Limited, Park Road, Gateshead, 8, have produced leaflet E, which describes and illustrates petrol-driven 8½-cub. ft. runabout truck. This truck has, interchangeably, either a platform or a tipping skip. It is known as the "Nip-skip," and for its operation utilizes a 3 h.p. air-cooled petrol engine. It carries a maximum load of 10 cwt., and has a speed varying from 3 to 5½ m.p.h. The leaflet is available to readers on writing to the Gateshead address.

Paddle-bladed Centrifugal Fans. Matthews and Yates Limited, Cyclone Works, Swinton, Manchester, have devoted a four-page leaflet (No. 4 DF/1) to describing a versatile form of paddle centrifugal fan. The flexibility permits of easy change of direction, by the mere removal of the side cover-plates, turning round the casing and reversing the impeller on the shaft. Obviously such a system has advantages to both user and manufacturer, as the latter can carry larger stocks. This leaflet, which has been nicely-produced is available to our readers on writing to Swinton.

Air-line Couplings. A leaflet received from Pneumatic Components Limited, Eyre Street, Sheffield, 1, deals with an important accessory for all users of compressed air. Known as the P.C.L. coupling it operates at pressures up to 300 lb. per sq. in. and is so constructed that the action is much the same as an electric-light plug. Its release automatically seals the main air pressure. It weighs only 7 oz. and the wearing parts are of case-hardened steel. The leaflet lists, illustrates and describes the spare parts and carries instructions for use. It is available to readers on writing to Sheffield.

Stone Patterns. "Titanite," manufactured by the Constructional Engineering Company, Limited, of Titan Works, Birmingham 12, is the subject of a well-presented, nicely-illustrated folder. Most of our readers are familiar with, and appreciative of, this useful adjunct to foundry practice. The folder gives instruction for the preparation of the pattern, speed of making, and dimensional accuracy. It is, however, in the field of durability, where surprising claims are made, as the folder states: "It is common for 40,000 moulds to be made from a 'Titanite' pattern." Again it is surprising to learn that models weighing 10 cwt. or more are made using this technique. This folder is available to readers on writing to Titan Works.

First-aid Requisites. As very unfortunately the foundry industry is quite a large buyer of first-aid equipment, readers will find much of importance for them in a catalogue (No. 43) just issued by Coxson, Gerrard and Company, Limited, of Fountain Lane, Oldbury, Birmingham. Spirally-bound, this well-illustrated 136-page catalogue is perhaps the most comprehensive one available. Accompanying the catalogue, as a separate booklet is a current price-list. The catalogue very usefully opens by outlining the statutory requirements, with explanatory notes, such as, for instance, that foundries employing 500 or more persons must provide an ambulance room. Not only are first-aid requisites covered, but items for accident prevention such as goggles and respirators are detailed. It takes four pages to list drugs and the like for people with transient ailments. The reviewer found much of interest in the catalogue, which is available to our readers on application to Oldbury.

New Equipment

Rotary-blast Wheelabrator Plant

The "Rotary-blast" plant is an addition to the normal range of tumbling-barrel-type plants manufactured by Tilghman's Patent Sand Blast Company, Limited, Broadheath, near Manchester, and is primarily intended for use in shops where the volume of work does not warrant the installation of the larger sizes of plant which have hitherto been standard.

The machine is air-less in operation, the effective cleaning action being provided by a 12-in. dia. Wheelabrator unit, which is an integral part of the machine, and is situated at the end of the barrel opposite the door. The unit operates at a speed of 2,900 r.p.m., and is directly coupled to a 10-b.h.p. high-torque motor. The unit is exactly as fitted to Tilghman's larger plants, which has established itself as an economic plant for cutting down cleaning time in many applications. Abrasive suited to the work is fed by gravity from a storage hopper into the wheel, and by centrifugal force is thrown upon the work to be cleaned, the wheel being equipped with a device for controlling the direction of the abrasive. After use, the abrasive is returned by a scroll, fitted between the outer casing and the barrel and is deposited into the boot of the bucket elevator, which returns it to the storage hopper ready for re-use.

The "Rotary-blast," shown with the barrel open in Fig. 1, will handle a load of 6 cwt., and has a work capacity of 6 cub. ft. The barrel rotates on four electrically-driven trunnion rollers at a speed of 2 r.p.m., and an interlocking gadget is provided which

(*Continued at foot of col.* 2)

FIG. 1.—*Rotary-blast cleaning plant, with the end door of the barrel opened; the impellor wheel can be seen at the opposite end.*

Another Scrap Price Offence

Because it was not possible to put a limited company in the dock, a director, standing by the solicitor's bench, answered charges against his company at Staffordshire Quarter Sessions last month. The company—a Bilston foundry—were accused of buying scrap iron at an excess price and on their behalf Mr. John Simpson Smith pleaded guilty to 11 summonses alleging the purchase of 389 tons 13½ cwt. of scrap at more than the controlled price. The company was fined £110 and was ordered to pay the costs of the prosecution.

The system adopted had been to have a series of invoices showing the amount delivered at the correct controlled price under the order and then from time to time sending fictitious invoices with no delivery of scrap. It appeared that since the matter came to light, the firm had applied to the Ministry of Supply, as they had always been entitled to do, for special permission to purchase scrap at more than the controlled price, and permission had been granted the previous month.

For the defence, it was stated that in 1952 when the firm was in a desperate state for scrap, and were faced either with closing altogether or working such short time that they could not in all decency expect their workpeople to remain, one of their regular suppliers then made them an offer of scrap, but said that it would have to be at an excess price. The amount paid included the cost of transport from Manchester to Bilston, and little as they liked the offer, the defendants did not see what else they could do.

Board Changes

CANNON (HOLDINGS), LIMITED—Dr. Harold Hollings has been appointed to the board.

GRAHAMSTON IRON COMPANY, LIMITED—Mr. R. Gardner has been appointed a director.

STEWARTS AND LLOYDS, LIMITED—Mr. W. C. Bell, Mr. E. G. Saunders, and Mr. J. N. B. Alexander have been elected directors. Mr. G. S. McLay has retired from the board.

WATSON, LAIDLAW & COMPANY, LIMITED—Mr. William More, chief draughtsman, Mr. Gordon Lamont, and Mr. George Morton Helme have been appointed additional directors.

NEWMAN INDUSTRIES, LIMITED—Mr. W. D. Wilson has been appointed to the board. He will continue in his present executive capacity as general manager of the company's Grantham works.

NORTH BRITISH LOCOMOTIVE COMPANY, LIMITED—Sir Andrew Macharg has retired from the board, and Mr. Hugh Cowan-Douglas has been appointed to succeed him. Mr. H. A. Siepmann, a former executive director of the Bank of England, has also been appointed a director.

(*Continued from col.* 1)

cuts out the wheel motor when the barrel motor is stopped. The machine is well suited to the cleaning of fragile pieces and one operator only is required. Ease of maintenance is a point which has received consideration at the design stage, and the number of wearing parts has been kept to a minimum. The plant is supplied complete with exhaust fan and an effective dust arrester, similar in design to the standard range or dust collector units manufactured by the firm.

Indian Iron and Steel Company

Foundry Facilities at Kulti

The importance of the Kulti plant of the Indian Iron and Steel Company, Limited, is on account of its iron foundry, which is the largest in the East. The foundry consists of five separate sections, each laid out for producing a particular type of casting.

(1) *General casting foundry* is equipped for producing all forms of general castings ranging from a few pounds to 30 tons in weight. Recent production has been:—1950-51, 12,406 tons; 1951-52, 14,972 tons; and 1952-53, 15,550 tons.

(2) *Cast-iron sleeper foundry* is equipped for producing cast-iron railway sleepers. Its production has totalled:—1950-51, 17,261 tons; 1951-52, 19,458 tons; and 1952-53, 9,862 tons.

(3) *Vertically-cast pipe foundry* produces cast-iron pipes ranging from 6 to 60 in. dia. Output in recent years has been:—1950-51, 11,977 tons; 1951-52, 11,745 tons; and 1952-53, 14,208 tons.

(4) *Light castings foundry* produces all forms of light section cast-iron products, particularly sanitary fittings, rain-water and soil pipes and horizontal pressure pipes up to 6 in. dia. Here recent production has been:—1950-51, 11,184 tons; 1951-52, 8,544 tons; and 1952-53, 11,039 tons.

(5) *Spun-pipe foundry*, which is the most recent of its kind in the East, was put into operation in November, 1945, for the production of cast-iron pressure pipes from 3 to 12 in. dia. by the centrifugal process, and has an annual capacity of 20,000 tons, which has been steadily maintained during the last three years.

A mechanized non-ferrous foundry has recently been added to the works and is equipped with all the necessary patternmaking, core-making, machining and finishing facilities. The total annual output from all foundries at Kulti is approximately 70,000 tons. The output of the non-ferrous foundry has been 1950-51, 168 tons; 1951-52, 215 tons; and 1952-53, 262 tons.

Iron-ore Imports

Iron-ore imports in March and the total for the first three months of this year compared with the corresponding period of 1953 are shown below.

Country of origin.	Month ended March, 31.	Three months ended March 31.	
	1954.	1954.	1953.
	Tons.	Tons.	Tons.
Sierra Leone	50,000	162,039	181,218
Canada	6,700	140,367	123,475
Other Commonwealth countries and Eire	12,565	13,677	3,713
Sweden	360,427	999,452	694,147
France	42,456	123,568	131,174
Spain	56,386	116,559	123,327
Algeria	191,190	509,271	399,081
Tunis	51,480	117,226	116,190
French Morocco	46,100	86,157	48,493
Spanish Morocco	28,324	67,157	68,440
Liberia	9,170	44,959	84,170
Brazil	55,320	99,185	59,778
Other foreign countries	65,629	228,438	76,298
TOTAL	975,747	2,708,055	2,109,504

MR. R. L. WALSH, Sheffield Master Cutler, has been invited by Mr. Peter Thorneycroft, President of the Board of Trade, to join the Council of Industrial Design. He will be a member until January 31, 1957.

British Industries Fair

Castle Bromwich Section, May 3-14

A number of individual stands at the Castle Bromwich section of the British Industries Fair which opened on Monday have already been referred to briefly in these columns and a further selection is included below. What was most striking in the exhibits available for viewing last Friday, when the Fair was open to representatives of the Press, was the attention given to displaying castings to better advantage. The stands of several well-known founders and groups of foundry firms were among the few that were completed and where visitors were welcome, and all these showed improvement of surface finish or decoration—vitreous enamel or sometimes just paint—that was truly noteworthy. A delightful contrast was presented to the austerity war-time finishes that persisted far too long into peacetime. Founders of malleable, brass, iron and steel castings are well represented among the hundreds of stands and one cannot but be convinced that it is not solely prestige value that makes so many come year after year. The Fair closes on May 14, and before that time all founders who can manage it should make an effort to compare the quality of their productions with those on show—not neglecting, of course, the exhibits of industries in one way or another competitive with the foundry.

OLDHAM & SON, LIMITED, invite foundrymen to inspect a collection of historic and modern industrial lamps and emergency lighting equipment on their stand (C414).

IN ADDITION to their normal range of products, Holman Bros. Limited, stand 1203/1102 (outdoor), are showing two entirely new machines. These are a pneumatic chipping hammer and a pneumatic grinder in the "Dustductor" range. These tools were recently developed, in co-operation with founders, to incorporate the latest ideas in dust removal.

"SERVICE TO INDUSTRY" is the theme of the Gas Council (stand D641/540), which is one of the "group" exhibits of major interest to foundrymen. It stresses the breadth and extent of the services which the industry can offer to all who have occasion to use gas. Side by side with this are shown examples of the newest developments in the design of industrial gas appliances, including furnaces (one to run at temperatures above 1,800 deg. C.), kilns, burners and accessories, instruments, ovens and refractories.

Changed Organization

British Industries Fair, Limited, has now been set up to take over the organization and management of the British Industries Fair to be held in 1955 and subsequently. The Birmingham section of the Fair will continue to be organized and run by the Birmingham Chamber of Commerce as hitherto, but the company will be responsible for publicity at home and overseas for the Fair as a whole. Sir Arthur J. G. Smout, J.P., has been appointed chairman of the company. Among the directors, Sir Ernest Goodale, C.B.E., M.C., chairman and managing director of Warner & Sons, Limited, and Mr. R. P. S. Bache, managing director of Geo. Salter & Company, Limited, have been appointed by the Presidents of the Board of Trade and of the Birmingham Chamber of Commerce, respectively. Mr. J. L. Reading, at present director of the London section of the Fair, has been appointed general manager of the company. The 1955 B.I.F. will be held in London and Birmingham from May 2 to 13.

One-coat White Enamel*

By J. Semple

After introducing the Paper by describing conditions in the vitreous-enamelling industry before the advent of super-opaque white enamels, the Author briefly deals with the characteristics and composition of the newly-developed material. Subsequently, the effect of introducing the super-opaque enamels on plant and material utilization, as well as the improved performance of the enamel in the enamelling shop and from the customer's point of view are adequately covered; effect on appliance design is also considered.

Vitreous enamel coatings for sheet and cast-iron had been in use for many years prior to the second world war on a variety of products, notably kitchen appliances and utensils, as a means of protecting the metal and providing a pleasing, easily-cleaned finish. Their use met with much success but there were serious disadvantages. They were poor in opacity and, to obtain an opaque finish and have have a good depth of colour, two or more applications of cover-coat had to be made. The consequent thick coating tended to shale badly under stress or impact in service, giving rise to the characteristic black "chips" on vitreous-coated ware. Heavy application and repeated firings made enamelling a costly process, without providing a very high standard of quality and durability in service.

The advent of acid-resisting enamels in the shape of antimony-opacified frits containing titania did much to improve the durability of the finish and did something to increase the covering power, but the need for heavy application persisted. By the late 1930's, the development of an enamel capable of giving good opacity with relatively low thicknesses was being vigorously pursued. From this work emerged the super-opaque or self-opacifying titanium enamel for sheet iron, which was to be the most successful answer to the problem.

Consideration of super-opaque white enamels will be confined to the self-opacifying titanium enamel, since the vast majority of cover-coat work in this country is now in this type. Zirconium- and zinc-opacified enamels have a limited use, but suffer from lack of durability; they are particularly lacking in stain resistance. The self-opacifying frit has a composition such that a supersaturated solution of titania in the glass is obtained in the fritting process. The composition is so balanced that during fusing of the glass in the enamelling furnace, some of the titania crystallizes in the glass layer in a finely divided state, producing a truly opaque finish.

Typical Compositions

Typical composition ranges for the two types of enamel are shown below:—

	Super-opaque per cent.	Two-coat per cent.
Alkali (Na_2O, K_2O)	10—15	15—20
Alumina	0— 5	0— 5
Boric oxide	10—15	7—10
Silica	45—50	45—50
Titania	15—20	13—18
Sod. silico-fluoride	0— 5	—
Phosphoric oxide	0— 2	0— 2

It can be seen that the super-opaque composition is higher in boric oxide and titania and much lower in alkali content. The low-alkali, high-boric-oxide composition yields an enamel of relatively low coefficient of expansion, a matter of great importance when the thickness of application is considered. The high-boric-oxide content of the frit produces a slurry liquor which tends to be rich in B_2O_3 relative to Na_2O and this produces a rather unstable slurry suspension, together with somewhat poor *bisque* strength. Hence, alkali and setting agent additions at the mill are considerable and liberal use must be made of *bisque* strengtheners, such as gum, urea and bentonite. The type of composition range shown for a super-opaque enamel produces an enamel of high viscosity at the fusing temperature and this proved to be a technical weakness in enamelling, due to "boil" or blister in the enamel layer. The introduction of small additions of lithium salts materially reduced the viscosity at enamelling temperatures and largely alleviated blistering; in addition, these modifications raised the expansion characteristics of the enamel to a more satisfactory level, viz:—

	Coeff. of expansion (cubical)
Two-coat enamels	300 to 320 $\times 10^{-7}$
Titanium enamel	230 to 240 $\times 10^{-7}$
Lithia-bearing titanium enamel	260 to 270 $\times 10^{-7}$

Properties

The modern super-opaque enamel for sheet iron possesses greatly increased covering power at much thinner application; its limitations being mainly those of relatively low expansion characteristics, sensitive suspension properties, rather poor *bisque* strength and sensitivity to colour variations. Thus the improvements brought about by its use are obtained only by strict technical control of its processing.

The introduction of super-opaque enamels on sheet iron was an event of great significance in the enamelling world. They were the fruits of the applications of scientific thought and investigation in an industry which had largely been governed by rule-of-thumb methods. They removed for ever the older methods of processing, where application under widely varying conditions was possible and recurrent and widespread processing faults were quite a normal occurrence. Instead, the production of

*This Paper was the winning entry for the 1953 Whittle Foundation competition organized by the Institute of Vitreous Enamellers. The Author is on the staff of the Radiation Group of Companies.

One-coat White Enamel

high-quality enamels demanded the development of technical control hitherto undreamed of. Haphazard methods of manufacture, application and processing were impossible, since the tolerance or "workability" of the new enamels was very much reduced, and good results were dependent on tight control of their use. Thus the development of these very specialized enamels saw the full application of the technical specialist in the enamel shop, and with the consequent technical standardization, mechanized production methods could be fully exploited.

Enamel Processing

In the ensuing remarks the effect of the super-opaque enamel and the advantages to be gained by it will be dealt with from the point of view of material and plant utilization, together with its improved technical performance in the enamel shop, its influence on design and marketing of appliances, and finally, its effect on appliance performance.

Material Utilization

The possibility of obtaining a satisfactory finish in one, thin application of cover-coat meant that the enameller could reduce considerably his consumption of enamel. The degree of saving would, of course, be governed by the amount of re-processing required and results are somewhat variable. It is fair to say that a good, antimony-opacified enamel requires 0.008 to 0.010 in. thickness of coating, while a coating of 0.004 to 0.005 in. of a super-opaque enamel is adequate; this means a possible saving is 40 to 50 per cent. The relative consumption figures for the types of enamel doing the same job are as follow:—

	Enamel Consumption (total)	Consumption for 100 plates.
Antimony-type ..	18,000 lb.	50.5 lb.
Super-opaque ..	9,200 lb.	28.7 lb.

A most important aspect of enamel utilization is the salvaging of enamel returns from spray booths, brushing tables, etc., and loss of these returns for any reason puts up enamelling costs appreciably. The adoption of one-coat enamels reduces the actual amount of enamel to be salvaged and, hence, wastage is less. However, there is an important qualification to this statement—when using a two-coat enamel, contamination of returns was comparatively unimportant, since all the returns could be, and indeed were, used to make up the first-coat enamel, keeping as much as possible of the second-coat enamel free from returns. This practice, of course, is not feasible when one-coat finish is the aim, and even moderate contamination can mean that the reclaimed enamel is unusable. In other words, the degree of utilization of returns now is dependent on the cleanliness of the shop and process, and the efficiency of the reclamation system.

Equipment Utilization

The reduced material requirement affects all other aspects of enamel-shop operation. Production capacity is increased by about one third due to this, and the fact that one operation has been eliminated throughout the process. This means that savings have been effected on capital expenditure on new plant, the efficiency of existing plant is raised, labour charges are considerably less and on-costs reduced.

The reduction in bulk of materials used has increased milling capacity to some degree, but here the adoption of finer grinding and harder frits have meant longer milling times and the cleanliness factor has demanded the use of harder and more expensive grinding media. An interesting development arising from the use of one-coat enamels is that improved methods are necessary in milling ground-coat enamel, since mill-stone contamination of ground-coat tends to come through into the cover-coat and entails re-processing. It is then doubtful if there is, on the whole, much saving in cost in the mill-room, but the quality of slurry being produced is higher.

Again, storing of the slurry now requires less space, but much improved container equipment is essential to prevent contamination. There is no doubt that the methods and equipment used for handling and transferring slurry have had to be improved by the use of the new enamels. The use of the new slurries of low specific gravity at thin application rates meant a reduction in spray-gun nozzle sizes and consequently increased control over spraying technique. This saved on material usually lost on overspray and reduced the shop rejects due to faulty spraying. The new enamels also lend themselves well to the use of low-pressure-fan spraying on large flat surfaces, where the gun nozzle is held close to the work being sprayed; economy in material here is self-evident. Again, in the modern automatic spray unit of the lay-down conveyor type, having a travelling multiple-spray-head, enamel wastage tends to be higher than in hand spraying due to the considerable overspray; in this respect, too, one-coat enamel is more economic, due to the lower delivery rate required. It is in the efficient utilization of mechanical spraying methods that the value of the super-opaque enamel can be very readily appreciated and it is literally true to say that a mass-production plant requiring one automatic spray unit to maintain sheet-iron ware production would require two such units or one plant plus many hand sprayers to maintain an equivalent output of two-coat enamelled ware.

Drying and Fusing

A variety of methods is employed for drying the enamel, from open, gas-fired stoves to infra-red radiation. In all cases, drying is a costly operation in relation to the result it achieves, that of simply removing water from the enamel layer. A thin layer of super-opaque enamel is more readily dried out and, in consequence, the efficiency of existing drying capacity can be raised. In the case of combined automatic spray/drier units, considerable saving in size of drying equipment and space have been achieved, while maintaining, or even increasing, conveyor speeds.

Output from fusing furnaces is similarly raised by the use of one-coat enamels. In addition to the

elimination of an operation, these enamels can be fused more rapidly with a greater degree of certainty. They are eminently suited for continuous-furnace-type fusing, the slow pre-heat giving a longer maturing range in the fusing zone, which develops full opacity and surface gloss.

Fuel

The consumption of fuel, whether it be gas, oil or coal, is a heavy part of the direct cost of running an enamelling shop. By eliminating the need for a second—cover-coat—operation, the change to one-coat enamels achieved a most spectacular economy. In terms of continuous-furnace operation over a five-year period, though the cost of fuel has risen by 50 per cent., the fuel cost for cover-coat fusing in one plant has dropped over that period by 7½ per cent. This can be attributed directly to use of one-coat enamels and, while it is true that production is now higher, the output could not have been raised to the present figure using two-coat enamels without installing extra fusing capacity.

Handling

The reduction in material requirements due to the adoption of super-opaque enamels alone has reduced direct labour requirements. From the milling stage onwards, handling arrangements can be reduced by about one-third as a maximum, since one cover-coat application and one cover-coat processing has been eliminated. In the enamel shop itself, of course, handling of work has been reduced by extensive mechanization in many cases, and the effectiveness of these improvements has been enhanced. Considerable reduction in the amount of "brushing" required has reduced the cost of this largely unproductive operation and new types of pressings with "horned" edges, the processing of which is only conceivable in one-coat enamels, are eliminating "brushing" as one of the major industries of the enamelling shop.

It must be emphasized here that these proved economies are obtained only by the strictest control over the elements of processing, both animate and inanimate. Apart from the saving in labour costs, reduced handling of ware reduces the amount of rejections for "marking" at the *bisque* stage, grease contamination and shop dirt.

Technical Efficiency

The actual physical reduction in the enamel-coat thickness has wiped out many of the technical defects met with in processing the thicker types of enamel coating. Thus hair-lining and strain-lining in cover-coat enamel, both defects much aggravated by excessive enamel thickness, have been greatly reduced and, indeed, in continuous-furnace fusing, virtually eliminated. The very good covering power has also taken care of the constant necessity for re-coating to cover "thin" areas, due to uneven spraying or over-fusing along edges. It cannot be fairly said that "re-boiling" in the cover-coat was eliminated by the early super-opaque enamels. In fact, due to their high viscosity, the "re-boil" defect and blistering in the cover-coat became a serious source of loss in one-coat enamel processing, but the introduction of low-viscosity enamels has reduced these troubles to small proportions.

However, the fluid, lithia-bearing enamels readily attack the colouring oxides at the fusing temperature and careful control of the weight of application and firing conditions is necessary to obtain consistent results. It might be useful to point out that careful colour checking at the milling stage does much to reduce colour differences on production work. The increase in opacity in the fused finish gives a brighter, cleaner appearance than was possible before, and the extra attention required in processing is well worthwhile. Deeper colours, such as greys and greens, have not been possible until very recently, but, nowadays, stable grey-blue colours are being used on a large scale with good results. Nevertheless, the colours are sensitive to differences between re-coated and first-coat work, and close control of fusing conditions is necessary to avoid colour variations.

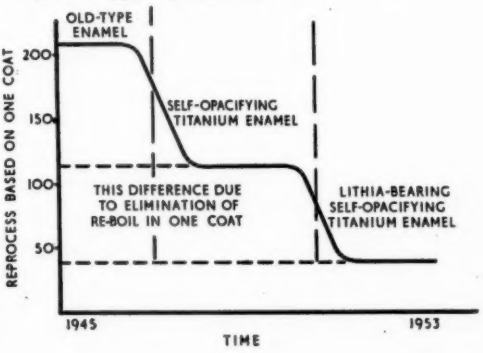
The use of a very thin coating renders the *bisque* more difficult to handle, and marking is probably the major source of re-processing work on these cover-coats; also, *bisque* tearing or parting along brush lines after fusing is characteristic of super-opaque enamels, particularly when drying conditions are poor. As the need for brushing disappears, however, these weaknesses become less evident. Thus the Author's firm has reached a position on cover-coat processing where technical deficiencies in the enamel account for only a small proportion of re-processed work, and shop faults such as "marking," "grease," "dirt," "blobs," etc., form the chief sources of rejection. This is an important factor, in that shop performances are now very much more within the control of the shop superintendent and he can pin-point sources of rejection much more readily and rectify them.

Relative re-process figures on the two types of enamel are given in Fig. 1.

Scrap

The amount of enamelled sheet metal rejected as a total loss, both in the enamel shop and in assembly

FIG. 1.—*Relative figures for re-processed ware for different types of enamel.*



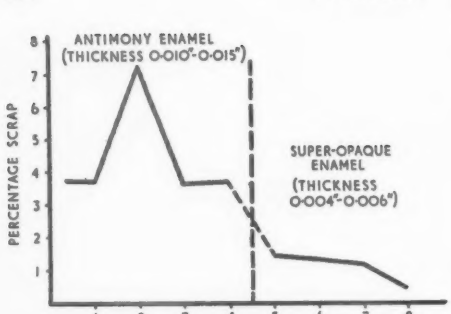


FIG. 2.—*Reduction in percentage scrap due to handling of enamelled ware, consequent upon the adoption of super-opaque enamel.*

or packing department, has been diminished by the use of one-coat enamels. Scrap losses due to "hair-lining," "strain-lining" and "re-boil" are virtually eliminated and losses from other sources much reduced. Much scrap after enamelling was caused by chipping or shaling of the enamel, particularly on components undergoing assembly or which required a lot of handling which involved bulk transference from place to place. Despite the higher expansion rates of the older type of enamel, total thicknesses beyond about 0.020 in. were very prone to shaling on corners and other points where metal stresses were high. By using the one-coat enamel, quite spectacular reduction can be achieved on this type of loss, and total scrap losses are down; some typical statistics illustrating this are shown in Fig. 2.

In this example, the super-opaque enamel was substituted for an antimony-opacified, acid-resisting enamel and processed in the same plant by the same operators. The change was solely responsible for the reduction in chipping losses.

Finish

The first effect of the use of super-opaque enamels was to raise considerably inspection standards on all types of sheet-iron work. The depth of colour and surface gloss was much improved and, as a result, the general appearance of the finish was enhanced. This brought about a marked change in the type of commercial vitreous enamel finish offered—from the darker colours, such as greys and green (frequently splattered or sponge mottled) to pastel shades in self-colours, cream, ivory, blue/whites, pink/whites, etc. The result was an immediate increase in the visual appeal of enamelled appliances which did much to stimulate consumer interest at a time when other types of protective coatings were being developed.

The introduction of these better finishes tended to stimulate the trend from cast-iron to sheet-iron components on gas and electric cookers and helped in the modification of appliance design. Much progress has been made in the manufacture of sheet-iron pressings for vitreous enamelling, all with a view to producing components with flowing lines and concealed edges. This, however, tends to increase the degree of stress in the metal along radii and on corners and it is difficult to imagine their being enamelled successfully in two-coat enamels without enormous scrap losses due to enamel shaling, strain-lining, etc. The thin coat of the super-opaque enamel, however, is meeting the new requirements, giving still better results at lower cost.

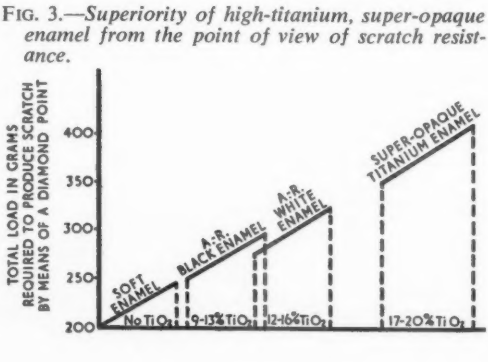
Enamel Performance

The durability of sheet-iron enamel finishes has been improved beyond recognition in the last 20 years. The use of the older type of acid-resisting enamels for the first time, established a standard in strain resistance, but their resistance to heat, thermal shock, impact and abrasion was relatively poor. Super-opaque enamels maintained the standard of acid resistance and materially improved the heat- and thermal-shock resistance. The intrinsic heat and thermal-shock-resisting properties are not appreciably better than the older type of acid-resisting enamel, but performance is much improved in this respect, due entirely to the use of a thinner coating. This, together with the lower expansion rates, has eliminated the "crazing" or cracking of the enamel layer under recurrent thermal gradients.

By virtue of the thin application, also, resistance to impact of the enamels is much improved and they are very extensively used for coating hollow-ware where chipping would expose the metal to foodstuffs, etc., giving rise to corrosive attack and failure of the utensil. Their improved abrasion resistance means that the ordinary domestic cleaning powder does not damage and erode the enamel layer to any great extent. This is an important factor in the durability of enamels. The abrasion resistance of an enamel increases with increasing titanium content and the super-opaque variety is superior to other types in this respect. This effect is shown in Fig. 3.

Super-opaque titanium enamels have enabled the enameller to produce a better and more durable finish at lower cost. Up to the present, their use has been limited to sheet-iron ware, the limiting factor being their low co-officient of cubical expansion. It seems probable, however, that these enamels will be adopted eventually for use on cast iron, with very beneficial results. They also seem well adapted for use direct on suitable steels, thus eliminating

FIG. 3.—*Superiority of high-titanium, super-opaque enamel from the point of view of scratch resistance.*



the present need for ground-coats and ground-coat processing. Successful development of the direct-application process would mean a reduction in enamelling costs which would make vitreous enamelling more competitive with high-grade synthetic finishes. This, together with their undoubted superiority of enamels in durability, would greatly widen the scope of application of vitreous enamels in the industrial field.

Discussion

The above Paper was given before a meeting of the Midland section of the Institute of Vitreous Enamellers and what follows is a summary of some of the opinions expressed on that occasion:—

The Paper was well presented by the Author but, naturally, his account was quite controversial and many members stated opposing views on the methods disclosed. One such opinion was that as yet for high-class hollowware titanium enamels in general were not satisfactory and an instance was given of two leading firms in the industry which, as yet, had found no use for titanium enamels. Other members were critical of the amount of re-coating which was said to be taking place, in many cases hinted this reached as high as 40 per cent. It was suggested by one well-established member of the Midland section that one-coat white enamelling was not a really adequate process.

The discussion then broadened, leading to the question of what constituted a one-coat white—was a ground-coat necessary, and if so then a one-coat white enamel on cast iron seemed best because cast iron would not have to have any ground-coat. The meeting also generally expressed the feeling that white enamels show better results generally on cast iron than they do on sheet iron. In the discussion it was also suggested that there was too much sheet steel being used in cookers and that to give a really substantial cooker of reasonable service "life" a greater use of cast iron should be made. Arguments were forthcoming to prove that enamelling of cast iron need not present the difficulty that it was generally supposed to.

The discussion continued for approximately 90 minutes and proved extraordinarily helpful to members as well as bringing out constructive criticism. At the conclusion of the evening all were agreed that the Paper was an excellent one and that the discussion it provoked was both interesting and educational.

Manual Workers' Wages

Average earnings of 6,750,000 manual workers, including men, youths and boys, women, and girls, at October, 1953, were £8 0s. 1d. a week, with the men earning an average of £9 9s. 2d., according to figures issued by the Ministry of Labour. Compared with October, 1953, the index (June, 1947 = 100) rose by eight points to 155 for all workers.

The figures relate to manual workers in the manufacturing industries and some of the principal non-manufacturing industries; the most rewarding was manufacture of metal, in which all workers averaged £9 16s. 6d. and men £10 10s. 3d., although men in paper and printing did better with £10 13s. 3d. In engineering, shipbuilding, and electrical goods the figure was £8 13s. 3d. (men £9 18s. 7d.).

In the year under review, the average working week was 46.3 hrs., including all overtime, but excluding all lost time. Men's average hourly earnings were 3s. 11.4d., and for all groups 3s. 5.5d. The engineering, shipbuilding, and electrical goods industries worked an average week of 46.9 hrs., against 47.2 hrs. in metal manufacture.

The Ministry's statistics for February show that the weekly full-time wages of 1,980,000 workpeople increased by £452,000. Those in building and civil engineering contracting, coal mining, and the railway service were principally affected. The weekly wage rate index at the end of the month stood at 139. Industrial disputes in February caused about 45,000 people to lose 131,000 working days. Stoppages beginning in the month totalled 183, and eight were carried over from the previous month.

NOTICE No. 78 (goods chargeable with purchase tax), issued by the Commissioners of Customs and Excise, has been revised and copies of the new edition are being sent to traders registered for purchase tax purposes. The revised notice supersedes notices Nos. 78 (January, 1953) and 78G (January, 1954).

Dust Control at Portable Abrasive Wheels

A new form of dust control has been devised for portable grinders. The method has been developed on a study of the aerodynamics of the system, as shown by cine-photographs of the moving dust clouds produced when grinding. It is described by A. T. HOLMAN and E. B. JAMES in Part I (dust control system) of a paper entitled the "Observation and Control of Dust at Portable Abrasive Wheels and Pneumatic Chisels," presented recently to the Institution of Mechanical Engineers. Part II (dust observations) was contributed by W. B. LAWRIE, M.Sc.

It was known from earlier work that the dust of respirable size range did not follow the sparks thrown off by a grinding wheel. In consequence, the present work, which represents the first attempt to control dust through a portable wheel-guard, was directed to the control of dust of the respirable size range. The local exhaust ventilation system was designed on a series 40 Holman grinder, fitted with a wheel 6 in. dia. with a free running speed of 6,000 r.p.m. and a peripheral velocity of 9,000 ft. per min. A wheel 5 in. dia. was also used on the same machine during the tests in order to estimate the effect of wheel wear.

The authors' conclusions state that the moving dust cloud can be stripped from the face of a rotating abrasive wheel by local exhaust ventilation, the dust being stripped from the wheel in about half its circumference. This result has been obtained by the application of very high velocity air at very low volume through a peripheral duct in the wheel hood, and the system has been shown to work successfully on a Holman eductor or on a rotary exhauster.

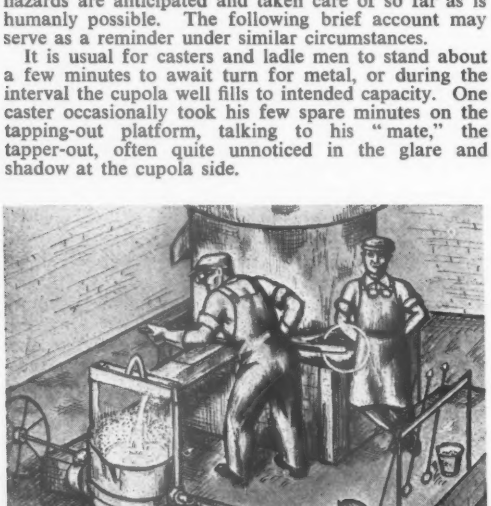
The use of an air jet to strip the dust from the portable abrasive wheel was found to be unnecessary. As an alternative an air jet can be used to increase the amount of air induced into the system, but it must be applied with great care if the disadvantages are not to outweigh the advantages. In the experimental work completed it was shown to be unnecessary.

An Unusual Accident

By "Jaques"

At a recent safety-first meeting, discussion turned to individual experiences on incredible accidents which develop in even the best regulated foundries, where hazards are anticipated and taken care of so far as is humanly possible. The following brief account may serve as a reminder under similar circumstances.

It is usual for casters and ladle men to stand about a few minutes to await turn for metal, or during the interval the cupola well fills to intended capacity. One caster occasionally took his few spare minutes on the tapping-out platform, talking to his "mate," the tapper-out, often quite unnoticed in the glare and shadow at the cupola side.



During the usual routine of picking out the tap-hole bot plus a stroke or two in the metal stream to repoint the tapping bar, a glance at the flow, then the automatic half turn of the shoulders brought the incandescently hot point in contact with the looker-on, and burned through his clothes in a flash without any appreciable pressure whatever, so quick, that the "recipient" did not know he was touched till a few minutes later.

Examination in the first-aid room indicated removal to hospital at once. A surgeon's abdominal diagnosis kept him in, and put the case in the emergency class. It could only be recorded on the accident questionnaire that "it was not part of his job to be at the side of the cupola on the tapping-out platform."

Annual Holidays.—The Handsworth works of the Northern Aluminium Company, Limited (producing castings and forgings) will be closed for the annual holiday from July 23 to August 9; their Banbury and Rogerstone works (all other products) from July 23 to August 10 and July 30 to August 17, respectively. This early notice is given to enable customers to make due allowance in planning their future ordering.

IN CONNECTION with a footnote in a recent issue of the JOURNAL to the effect that the use of sand is prohibited in this country for blasting purposes, we are asked by Associated Lead Manufacturers, Limited, Crescent House, Newcastle-upon-Tyne, to point out that zircon sand, under the trade name "Zircosil," is in fact officially approved for blasting purposes. It is silicious material to which the prohibition applies.

Publications Received

Handbook of the Fan Engineering Industry. Published by the Fan Manufacturers' Association Limited, 59 to 62, High Holborn, London, W.C.1. Price 3s. 6d., post free.

This 58-page booklet well serves the purpose of setting out in some detail the scope of the modern fan manufacturer. This industry is indeed of great importance to the community, for instance, the ventilation of mines and London's underground railways are major engineering undertakings. The book carries a series of illustrations, showing the application of fans to a wide variety of industries including one of a non-ferrous foundry.

Pig Irons of Great Britain (8th Edition). Published by Darby and Company, Navigation Street, Birmingham, 2.

The title of this publication is no longer strictly true as it now includes the composition of Dominion and foreign pig-irons. It is difficult to imagine a book of greater convenience to the grey and malleable iron-founders than this one, for, in an extremely handy form, there are the compositions of not only pig-iron but also coke, limestone, ferro-alloys, firebrick and ganister. The book has the added advantage of showing a steady evolution in respect to certain elements. Being a limited edition, copies are only available to actual iron-foundry personnel.

British Foundry Plant and Supplies. Published by the Foundry Trades Equipment and Supplies Association, 94/98, Petty France, London S.W.1.

Some years ago, the Foundry Equipment and Supplies Association, through the Board of Trade sent to overseas foundry owners a brochure detailing by listing and advertisement the machinery and raw materials made or supplied by its members. Now, a second edition has been published and unlike the former it is being distributed to both home and overseas foundries.

It is unique in character as it confines itself solely to the requirements of the foundry industry and does so, first by some germane remarks as to the history of the Association, the *rôle* of equipment and mechanizations in the modern foundry, mechanical handling and consumable stores. Then there is given a selection of data most used in the foundry. An alphabetical list of 110 items used in the industry gives the names of actual makers and merchants. It is desirable to include the latter, because for many items it is more convenient to place an order with one firm. In at least one case, the manufacturers of a product regularly used in foundries will only sell to merchants.

The British foundry equipment industry is no longer the struggling aggregation of mostly small firms, as was the case before the war, but is one doing an immense overseas business. Its recent expansion is impressive and its efforts to meet new developments can best be indicated by the statement that about eight concerns are manufacturing shell-moulding equipment. It is a little unfortunate that there is no heading for this type of equipment, but recipients of the booklet are clearly shown how to obtain the latest information on such matters.

The booklet is available to those of our readers, who have not yet received a copy direct—especially does this refer to overseas founders.

MR. PETER LOWE, director of Acme Conveyors, Limited, will be attending the American Foundrymen's Convention at Cleveland, Ohio, during May.

Company News

FISHER & LUDLOW, LIMITED, makers of metal pressings, etc., of Birmingham—In this and subsequent years the accounts will be made up to July 31 instead of March 31.

DERBYSHIRE STONE, LIMITED—Application is being made by the directors for permission to capitalize £112,500 of reserves for a scrip issue of one 5s. share for every 15s. nominal share of ordinary stock held.

TEXTILE MACHINERY MAKERS, LIMITED—The directors announce that the Capital Issues Committee has consented to a one-for-four scrip issue. They add that from provisional figures, the year's profits will be down on the previous year, but will justify the maintenance of the dividend on the increased capital.

SMITH & WELLSTOOD, LIMITED, stove, range, and boiler makers, of Bonnybridge (Stirlingshire)—The company have issued a further 37,300 ordinary shares of 5s. each, allotted fully paid up, as part consideration for the purchase of a large holding of ordinary £1 shares in its subsidiary, Mitchell Russell & Company, Limited.

MANGANESE BRONZE & BRASS COMPANY, LIMITED, London, W.1—In his annual statement, Mr. J. C. Colquhoun, the chairman, says that with regard to prospects, experience of 1954 to date indicates no improvement over 1953 and it is impossible to say at the moment that profits will not recede still further from the peak year of 1952.

H. & J. HILL (WILLENHALL), LIMITED, malleable and soft grey-iron founders, etc.—A final dividend is announced of 30 per cent. to make a total of 40 per cent. for the year 1953, on the increased capital of £49,700. The total dividend for 1952 was 50 per cent. on £35,500. Profits, subject to tax of £12,662 (£33,841), contracted from £46,256 to £24,779.

CRAVEN BROS. (MANCHESTER), LIMITED, machine-tool makers, etc.—The chairman, Mr. J. R. Greenwood, states that the company's output in 1953 was the highest in its history and the volume of firm orders on the books at the end of the year constituted a record. The high percentage of home business of recent years is reducing a little and the percentage of export business is increasing.

FEDERATED FOUNDRIES, LIMITED, Glasgow—Profits have fallen heavily, but the ordinary dividend for 1953 is maintained at 17½ per cent. Group trading profit and investment income have dropped from £1,183,920 to £402,169—a decline of £781,751, but the result of a greatly diminished tax provision together with large tax credit is that the net balance of profit is only £37,181 lower at £312,402.

CROFTS ENGINEERS (HOLDINGS), LIMITED, Bradford—In connection with the one-for-one ordinary free scrip issue recently announced, the directors propose to increase the nominal capital of the company from £900,000 to £1,500,000. This is in excess of present requirements to meet any future contingencies, but there is no intention of issuing the balance of 800,000 ordinary shares at the present time, the directors add.

ELLIOTT BROS. (LONDON), LIMITED, electrical and mechanical engineers—The company is paying a dividend of 20 per cent. on £220,000 ordinary capital for 1953, as forecast, compared with 15 per cent. on a £145,000 ordinary capital for the previous year. The ordinary shares issued last month did not rank for the 1953 dividend. Profit, before tax, has risen from £108,726 to £142,082, and net profit from £91,226 to £124,802.

STURTEVANT ENGINEERING COMPANY, LIMITED, heating, ventilating, and air-conditioning engineers, of London, E.C.4—The directors recommend a final dividend of 14 per cent., free of tax, on the present capital of £443,826, making 18.89 per cent., against 18.09 per cent., on the increased capital for the year ended December 31, 1953. Group profit has increased from £640,019 to £743,476, of which taxation absorbs £441,950 (£338,775).

VULCAN FOUNDRY, LIMITED, Newton-le-Willows (Lancs)—For the first time since 1939, the problem of manufacturing at competitive cost has become serious, says Viscount Bridgeman, chairman, in his statement with the 1953 report. Steel supplies have improved, but the two-year shortage of steel plate created a bottleneck and locomotive deliveries are running late. In addition, deliveries which could be offered were unfavourable compared with foreign competitors, owing to the size of the company's order-book.

HOPKINSONS, LIMITED, makers of boiler mountings, valves, etc., of Huddersfield—The directors recommend a final dividend of 12½ per cent., making 20 per cent., less tax, for the year to January 31, 1954, on the £700,000 ordinary capital as increased by a 100 per cent. scrip issue. This is equivalent to 40 per cent. on the former capital, and compares with 32½ per cent. for the previous year, when the interim dividend was 10 per cent. and final 22½ per cent. After an increased taxation charge of £537,200, against £487,750, the net profit has expanded from £350,137 to £392,632.

BRITISH ROLL MAKERS' CORPORATION, LIMITED, Wolverhampton—Despite a marked falling off in orders in certain directions, total sales, both in tonnage and value, for the year 1953, surpassed any previous figures. This is stated by Mr. O. F. Grazebrook, the chairman, in his annual review. Group trading profit rose from £497,263 to £533,377 and the ordinary dividend was raised by 1 per cent. to 13 per cent., less tax. Total dividends distributed amount to only just over one-third of the net profit—£210,745 (£176,963)—of the year, and E.P.L. alone—£43,000 (£34,500)—is not far short of the final ordinary dividend, states the chairman.

WILLIAM BEARDMORE & COMPANY, LIMITED, steelmakers, etc., of Glasgow—A final dividend of 11.66 per cent. to make a total (as before) of 17½ per cent. for the period to October 3, 1953, is announced by the company, whose shares are vested in the Iron and Steel Holding and Realization Agency. Group profit for 53 weeks, before tax, was £705,629, against £756,303. The chairman, Sir Alexander Williamson, says that turnover exceeded that of 1952 and the margin of profit on deliveries was maintained, but "windfall" profits from price adjustments were lower. Factors cited by Sir Alexander "militate against a continuance of the profits realized in the past two years."

C. A. PARSONS & COMPANY, LIMITED, engineers, turbine manufacturers, etc., of Newcastle-upon-Tyne—The board recommends a final dividend of 4½ per cent., less tax, on the £3,600,000 ordinary capital as increased by a 100 per cent. scrip issue, and by 100 per cent. rights issue. An interim dividend of 6½ per cent. has already been paid in respect of the year 1953, prior to these issues. For the year 1952 a total of 12½ per cent.—interim 5 per cent. and final 7½ per cent.—was paid on the £1,200,000 capital. After an increased taxation charge of £1,560,000, compared with £1,337,500, and after deducting contingencies provision of £30,000, against £20,000, the net profit is slightly lower at £807,862, against £814,598.

Personal

MR. ROBERT J. BARCLAY has been elected a director of John Brown & Company, Limited, Clydebank.

MR. PHILIP G. SMITH, of Bassett, Smith & Company, has been elected chairman of the London Metal Exchange.

MR. FITZHERBERT WRIGHT has resigned from the Boards of Minworth Metals, Limited, and its subsidiary, Britannic Alloys, Limited.

MR. W. J. PEACOCK, who has recently completed 50 years in the iron foundry of the English Electric Company, Limited, at Rugby, is retiring at the age of 67.

MR. GEORGE BENTLEY, public relations officer at the English Steel Corporation, Sheffield, is taking up the post as publicity manager of Thos. W. Ward, Limited, Sheffield.

MR. D. D. FRAME, chairman of the Hammond Lane Foundry Company, Limited, Dublin, has been co-opted to the Port and Docks Board and also appointed a Commissioner of the Peace.

MR. A. V. NICHOLLE, chairman of the Sheepbridge Engineering group, Chesterfield, sailed in the Queen Elizabeth on April 29 to visit the new works of his company at Guelph, Ontario.

MR. G. W. BUSH has relinquished his connection with Renshaw Foundry, Limited, Mill Mead, Staines, Middlesex, and the management will be carried on by MR. G. K. SMITH and MR. W. T. MORTON, F.C.C.S.

LAST TUESDAY, Mr. T. H. Summerson relinquished the presidency of the British Steel Founders' Association and Mr. F. N. Lloyd, the vice-president, assumed that office. Mr. G. M. Menzies is the new vice-president.

MR. P. L. WARD, B.SC., a past-president of the South African branch of the Institute of British Foundrymen and manager of African Malleable Foundries, Limited, has left the Union to take up an appointment in Canada.

MR. JAMES LEEK, managing director of the Small Heath group of the Birmingham Small Arms Company, Limited, left recently on a five-week tour of the United States and Canada to discuss with the company's distributors future trading arrangements and further exports.

MR. CHARLES NICHOLSON, cashier with Thomas Firth & John Brown, Limited, steel manufacturers, of Sheffield, since 1934, has retired. Altogether he has been with the firm for 46 years. The presentation of a gold watch was made to him on April 30, by Dr. Charles Sykes, general manager of the company.

MR. M. A. FIENNES, managing director of the Davy & United Engineering Company, Limited, Park Iron Works, Sheffield, left Southampton in the Queen Elizabeth on April 29 for a two-months' business visit to the United States. He is visiting Pittsburgh to the company's associated rolling mills and works, and other American steel centres.

MR. CHARLES ROBSON, commercial director of Ashmore, Benson, Pease & Company, Limited, and the Power Gas Corporation, Limited, Stockton-on-Tees, has been elected president of the Tees-side and South-West Durham Chamber of Commerce. He was secretary of both companies from 1939 until January, 1953, and was appointed chairman of the Tees-side Productivity Committee last May.

Obituary

MR. W. P. SNEDDEN, chief technical engineer of the rolling-mill division of British Timken, Limited, Northampton, died last month.

MR. AUSTIN MALIA, managing director of the Buma Engineering Company, Limited, Newcastle-upon-Tyne, has died at the age of 66.

MR. S. J. E. HUMBLE, chief buyer and commercial manager of Samuel Talbot, Limited, engineers, of Gateshead, has died at the age of 57.

MR. WILLIAM HENRY BOWATER, who was a co-director, with his son, of the Sheffield Steel Agency in Birmingham, died at the age of 67.

THE DEATH is announced of MR. JACK HALE, a director of J. H. Heaton, Limited, washing- and wringing-machine makers, Globe Iron Works, Keighley.

MR. WILLIAM MATTHEWS, formerly patternshop and foundry manager of the Wallsend Slipway & Engineering Company, Limited, has died at the age of 86.

THE DEATH is announced of MR. ALBERT WILKES, at the age of 79. He was senior partner in the firm which he founded in 1898, Albert Wilkes & Son, founders, Bloxwich.

MR. GEORGE HODGKINSON, of Sheffield, who has died at the age of 90, worked for 65 years for W. A. Tyzack & Company, Limited, Stella Works, Sheffield, before retiring 11 years ago.

MR. PHILIP WALTER PEARSON, of Woodhouse Road, Edgbaston, chairman and managing director of F. W. Ratcliffe & Company, Limited, Anchor Ironworks, Oldbury, and director of Granville Land & Industries, Limited, has died at the age of 57.

THE DEATH has occurred of MR. ARCHIBALD N. GRIERSON, who was technical manager with David Rowan & Company, Limited, marine engineers and boilermakers, of Glasgow. Mr. Grierson was awarded the M.B.E. in 1950 for outstanding service to engineering during two world wars.

MR. PHILLIP T. WARD, of Coal Aston, Nr. Sheffield, a director of Thos. W. Ward, Limited, died on April 29. He was 35 years of age. He commenced his career with Thos. W. Ward, Limited, in 1937, and was appointed a full director in 1948. He was also a director of Birchley Rolling Mills, Limited, Darlington Railway Plant & Foundry Company, Limited, and John Williams (Wishaw), Limited.

COMMODORE THOMAS MCKENZIE, a director of Metal Industries, Limited, and managing director of their subsidiary company, Metal Industries (Salvage), Limited, Faslane, died recently at the age of 62. One of the world's greatest salvage experts, he spent 14 years as chief salvage officer in the task of raising the sunken German Fleet at Scapa Flow. In 1941 Mr. McKenzie was awarded the C.B.E. and in 1945 the C.B.

MR. WILLIAM CURRER RATTRAY, of Falkirk, who has died at the age of 62, was commercial manager of Callendar Abbots Foundry Companies, Limited. A native of Linlithgow, he was schooled in Helensburgh and Falkirk and served his apprenticeship with the Camelon Iron Foundry. He lived in the town for more than 45 years and was associated with the Callendar Iron Company and later the Callendar Abbotts & Allied Ironfounders, Limited, for over 40 years. He was a former president of Allied Ironfounders Sports Committee, of which he was a member at the time of his death.

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ALUMINIUM AND MAGNESIUM ALLOY INGOTS FOR FOUNDRIES — — BILLETS FOR EXTRUSION ROLLING AND FORGING — — STICKS AND SHOT FOR STEEL MAKING

News in Brief

AN OIL COMPANY has ordered fifty rail-tank cars from Hurst, Nelson & Company, Limited, of Motherwell.

THE BRITISH INSTITUTE OF MANAGEMENT is organizing a work study conference at Harrogate during the period May 27-29.

THE INSTITUTION OF PRODUCTION ENGINEERS announce a change of address to 10, Chesterfield Street, London, W.1. Tel.: GROsvenor 5254/9.

THE 35TH ANNUAL EXHIBITION organized by the Institute of British Photographers is being held at the R.B.A. Gallery, Suffolk Street, Pall Mall, from May 8 to June 1.

THE LEASE of a site for a factory in Ranesway, Derby, has been taken by Seymour's Castwell Foundry, Limited, for 99 years, and a service road is to be constructed to the site.

THE NEW Birmingham Exchange and Engineering Centre, which as previously announced will be Britain's only permanent engineering exhibition, is to be opened by Lord Bennett on June 17.

THE BRITISH-SWEDISH Chamber of Commerce in Sweden, with headquarters in Stockholm, was formally inaugurated at a meeting held there on April 29. It is expected to be in full operation by the end of the summer.

THE WELL-KNOWN textbook, "Modern Foundry Practice," which has been out of print in recent times, is again available from Odhams Press, Limited, 24, Henrietta Street, Covent Garden, London, W.C.2. Price 12s. 6d. net.

MR. GABRIEL P. CLAY, chief engineer of the Metals Division, I.C.I., Limited, Birmingham, has been appointed to the board of the Division. He has been at Birmingham since 1949 and chief engineer since the beginning of 1953.

THOS. FIRTH & JOHN BROWN, LIMITED, and Firth Brown Tools, Limited, of Sheffield, were visited on April 27 by pupils of Audley Park Secondary Modern School, Torquay, who were making an industrial tour of South Yorkshire.

INCREASES of ½d. to 2d. a lb. in the prices of the British Aluminium Company's goods came into effect on April 20. The company states that the increases result from the recent wage awards to the shipbuilding and engineering unions.

A PERMIT has been granted Hinckley's, Limited, to work the New Windsor Rose sand deposit in the Sandbach area, following group representations of foundrymen, in which the Association of Bronze and Brass Founders participated.

FOUNDRY SERVICES, LIMITED, Long Acre, Nechells, Birmingham, 7, have just issued a pamphlet covering the aluminium/magnesium alloy B.S. 1490-LMIO, and include the use of proprietary materials for attaining good results during manufacture.

AT the Sutton-in-Ashfield works of Sheepbridge Steel Castings, Limited, a new bronze foundry is in course of construction for the production of intricate castings in non-ferrous alloys such as high-tensile manganese-bronze, nickel-bronze and aluminium-bronze.

THE NEW PRESIDENT of the Sheffield Chamber of Commerce is Mr. D. A. Palmer, in succession to Mr. G. M. Flather, the steel manufacturer, who has held the post for the past year. Mr. F. A. Hurst and Colonel C. R. Hodgson were elected vice-presidents.

SENIOR OFFICERS from the Imperial Defence College visited the Sheffield works of George Wostenholm & Son, Limited, cutlers, and the Thorncliffe works of Newton Chambers & Company, Limited, recently, as part of their course, which included a tour of industrial undertakings.

JOHN HARPER & COMPANY, LIMITED, announce that they have appointed Mr. H. Moore as their foundry sales representative in the London area. Mr. Moore, who has been with the company for 28 years, will be working under the general direction of the London manager, Mr. V. A. Lloyd.

THE REFRACTORIES ASSOCIATION OF GREAT BRITAIN announces the establishment of a fellowship for research into problems of the refractories industry at Sheffield University. The fellowship will be known as "The W. J. Rees Fellowship," in commemoration of the late Dr. W. J. Rees, a past-president of the Association.

NOTTINGHAM UNIVERSITY has offered a research fellowship, value £600 a year, to a candidate likely to make a significant contribution to knowledge in any of the following subjects:—Civil, mechanical, electrical or mining engineering and metallurgy. Applications should be made to the Registrar not later than May 15.

MR. GEORGE POLLOCK, director of the British Employers' Confederation, gave the inaugural address on Public Relations and Productivity at the annual conference of the Institute of Public Relations at Stratford-on-Avon on May 1, which was attended by delegates from America, France, Holland, Belgium, Italy, Western Germany, and Norway, as well as this country.

SIXTY JUNIOR MEMBERS of the Iron and Steel Institute meeting at Buxton in the last week in April paid visits to Sheffield industries. Among the works they saw were the Davy & United Engineering Company, Limited, and the Park Gate Iron & Steel Company, Limited, Rotherham, on April 27. The next day they went to Steel, Peech & Tozer branch of the United Steel Company, Limited.

TO MEET expanding production needs, the Dunlop Rubber Company, Limited, has acquired for £750,000 the entire share capital of Brynmawr Rubber, Limited, from Enfield Cables, Limited. The factories at Brynmawr and Cwmavon will provide the Dunlop Rubber Company with additional space for the manufacture of products other than tyres, and, for the time being, existing production will be continued.

MEMBERS of the Imperial Defence College have made a week's tour of industrial undertakings in Sheffield. Firms visited included the works and training college of Newton Chambers & Company, Limited, Thorncliffe, after which they were entertained by Sir Harold West at Staindrop Lodge, Thorncliffe; David Brown Corporation, Limited; and Thos. Firth & John Brown, Limited, steel manufacturers.

AT LAST WEEK'S annual meeting of the British Electrical and Allied Manufacturers' Association, Sir George Bailey was elected president. Mr. D. D. Walker, chairman and joint managing director of Evershed & Vignoles, Limited, was re-elected chairman of the B.E.A.M.A. council and Mr. E. H. Ball, managing director of the British Thomson-Houston Company, Limited, was re-elected vice-chairman.

FOUNDRIES, together with mills, factories, collieries, quarries and similar undertakings, will be affected by a

(*Continued on page 544*)

How many? *50 to 60 moulds per hour*

How much? *Less than £600*

How soon? *Delivery in 8/10 weeks*

The 'Shelmolda Duplus' is a compact and simple machine, automatic in action but with each stage of the shell moulding process under the operator's control. The size of plate is 24" x 16" and as the oven is constantly curing, the machine is very economical in operation. May we send you full particulars.

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News in Brief

(*Continued from page* 542)

new tariff which the Yorkshire Electricity Board hopes to introduce before the end of the year. Aimed at standardizing charges in accordance with the Electricity Act of 1947, it will affect 17,000 industrial consumers in the area. The pricing system for domestic and commercial consumers has already been reviewed.

AT the annual general meeting of the Pig Iron Merchants' Association, held on April 29, the following officers were elected:—*Chairman:* Mr. F. A. Wilson (Wm. Jacks & Company, Limited); *vice-chairman:* Mr. A. Carr (Thos. W. Ward, Limited); *hon. treasurer*: Mr. Claude A. Parson (Parson, Limited); *secretary:* Mr. S. Owen; *committee members:* Darby & Company; Leigh & Sillavan, Limited; and Thos. S. Smeeth, Limited.

FROM TIME TO TIME the Birmingham Museum of Science and Industry operates a 3½-h.p. Tangye gas engine. Next winter, it will also begin periodically to operate a 3-in. bore, single-cylinder fairground organ engine which has been presented in good working order by Mr. T. C. Hunt, Mr. A. J. Kent, and Mrs. S. H. Tapper. The engine was made in 1898 by Savages, of King's Lynn, to run at a speed of 150 r.p.m. and a steam pressure of 80 to 100 lb. per sq. in.

MR. K. A. ZANDSTRA, A.M.I.E.E., technical sales manager for h.-f. heating equipment in the industrial division of Philips Electrical, Limited, recently completed twenty-five years' service with the organization. At a celebration luncheon, Mr. S. G. P. de Lange, commercial manager, industrial division, on behalf of the company, presented Mr. Zandstra with a cheque and an inscribed gold wrist watch; Mr. E. S. Waddington presented a writing case from members of the staff.

A CONTRACT for two turbo-alternators, valued at £1,477,000, for the Victoria Power Station, Belfast, has been awarded to C. A. Parsons & Company, Limited, Newcastle-upon-Tyne. Four boilers, costing £1,507,000, have been ordered from Mitchell Engineering, Limited, Peterborough, and three boilers (£1,316,000) from Babcock & Wilcox, Limited, while Stewart & Partners, Limited, Belfast, has secured the contract for the excavation and piling, which is valued at £115,000.

I.T.D., LIMITED, of 95-99, Ladbroke Grove, W.11, announce the addition of the new Diesel-powered fork-lift truck, model 60DH. This truck will be on view for the first time at stand No. D3, Grand Hall, during the forthcoming Mechanical Handling Exhibition to be held at Olympia. This particular model is a heavy-duty unit which has a maximum capacity of 7,000 lb. (3,175 kg.), and the overall dimensions and design are such as to give a good range of manœuvre in confined spaces.

HAVING REACHED the normal retiring age for the company's staff, Mr. Robert Ray, who has represented the coke-oven interests of Woodall-Duckham Construction Company, Limited, in the north of England and Scotland since 1928, retired last Friday. Following upon Mr. Ray's retirement, the company's office at 448, Abbeydale Road, Sheffield, will be closed and all matters dealt with there will, in future, be handled by its representatives at 22, St. Anne's Square, Manchester, 2, or 1, Castle Street, Edinburgh, 2.

THE TRANSFER of responsibility to the National Industrial Fuel Efficiency Service from the Ministry of Fuel and Power took place on May 1 as recently announced in the House of Commons. Sir Leslie Hollinghurst, chairman of the Board of the new Service, has stated that arrangements have already been made for the secondment to N.I.F.E.S. of the majority of the engineering staff of the Ministry's Fuel Efficiency branch, to form the nucleus of the new organization. He stressed the fact that N.I.F.E.S. will collaborate with other existing organizations that are aiming at improving the efficiency with which fuel is used in industry.

THE *Bureau International de la Récupération* (*B.I.R.*) is to hold a congress concluded by the annual general assembly on May 12, 13 and 14 in Amsterdam. Meetings of the permanent committees (rules and regulations, finance and propaganda and public relations) will mark the start of the annual congress on Wednesday; Thursday will be devoted to the technical section meetings; the management committee meeting will be held on Friday morning, and the general assembly will take place on Friday afternoon. All business sessions and the annual general assembly will be held at the Carlton where will also take place the official dinner which concludes all B.I.R. congresses.

A SCHEME by which David Brown Tractors (Engineering), Limited, Meltham, Huddersfield, will send components for agricultural implements to Booth, Macdonald & Company, Limited, of Christchurch, New Zealand, where they will be assembled, has been agreed between the companies. This step has been taken because of the recent prohibition of the importing of agricultural implements into New Zealand. The scheme will begin to operate in August. The David Brown company has also agreed to send full technical research and production data to the New Zealand firm to manufacture implement components from New Zealand materials. Booth, Macdonald & Company will collaborate with the design of equipment specially suited to local farming conditions.

IT WAS ANNOUNCED on April 27 that the engineering interests of Chance Bros., Limited, of Smethwick, have been sold to J. Stone & Company (Holdings), Limited. The statement revealed that the interests include the manufacture and sale of Sumo electro-submersible pumps, Austinlite (automatically-controlled electric generating plant), switches and instruments and marine lighting and fog-signalling apparatus in all its forms. A new company is to be formed with Mr. Bryan Preston (deputy chairman of J. Stone & Company (Holdings), Limited), as chairman, and Mr. John Raymond, previously managing director of Chance Bros., Limited, as managing director. The two principal subsidiary companies, Sumo Pumps, Limited, and Austinlite, Limited, will continue to handle sales of pumps and electrical equipment.

THE EXPORT CREDITS GUARANTEE DEPARTMENT (the Government Department providing insurance against the major risks of exporting) announces that it is resuming a limited cover on exports to Brazil. It suspended the issue of all fresh cover for Brazil in May, 1952, at a time when its gross liabilities in that market totalled some £32 millions. Cover on resumption will be limited to 80 per cent. of the credit granted (as against the normal 90 per cent. for most risks); the waiting period before loss is ascertained will be 12 months (as against the normal six months): there will be no cover for goods not of United Kingdom origin: exchange sale notes must be produced covering all payments due, and the Department will require prior proof of compliance with import licensing and exchange formalities before it comes on risk for any transactions.